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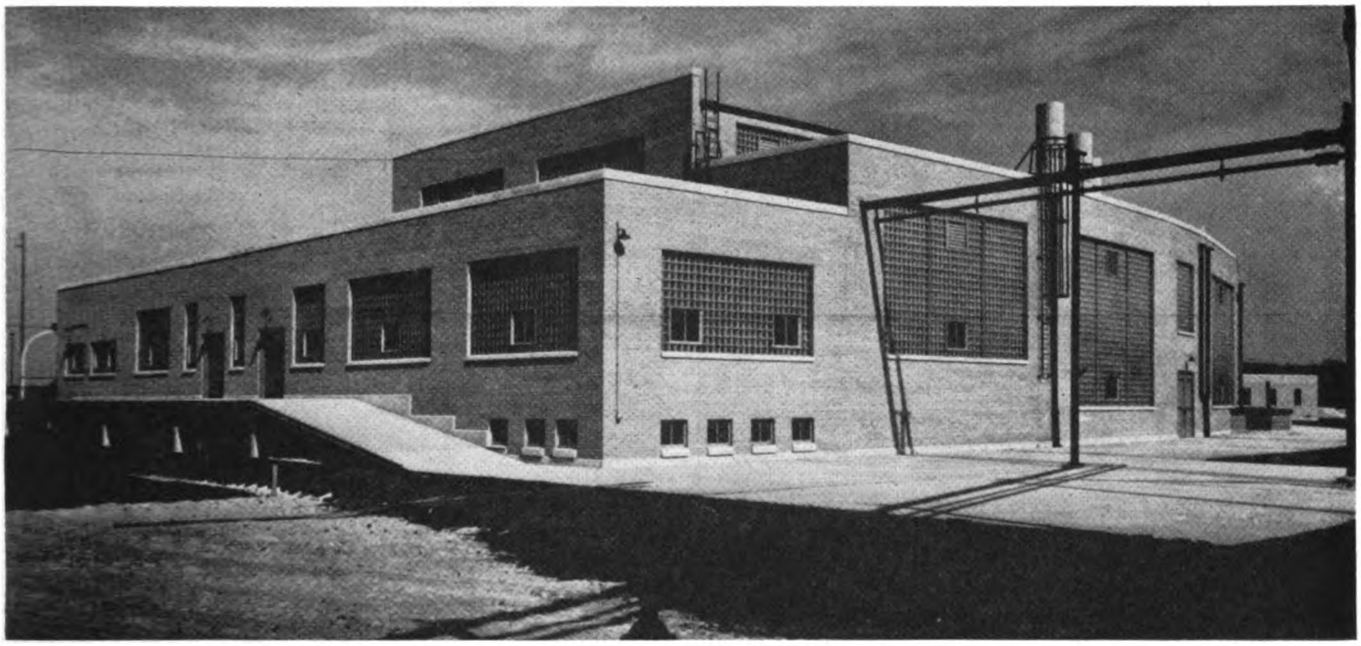


Nickel Plate Moves Into New Calumet Terminal

On September 30 the New York, Chicago & St. Louis abandoned its old 93rd street, Chicago, engine terminal, built in 1882, and moved to a new terminal two miles south between 103rd and 110th street.

Built at a cost of approximately $2.8 million, the new terminal is designed for servicing freight and passenger steam locomotives and passenger and switcher diesel locomotives of both the Nickel Plates and the Chesapeake & Ohio. Since the Nickel Plate's main locomotive shop at Conneaut, Ohio, is thoroughly equipped to handle heavy repairs to both diesel and steam locomotives, it was not necessary to design the new Calumet terminal for making such repairs.

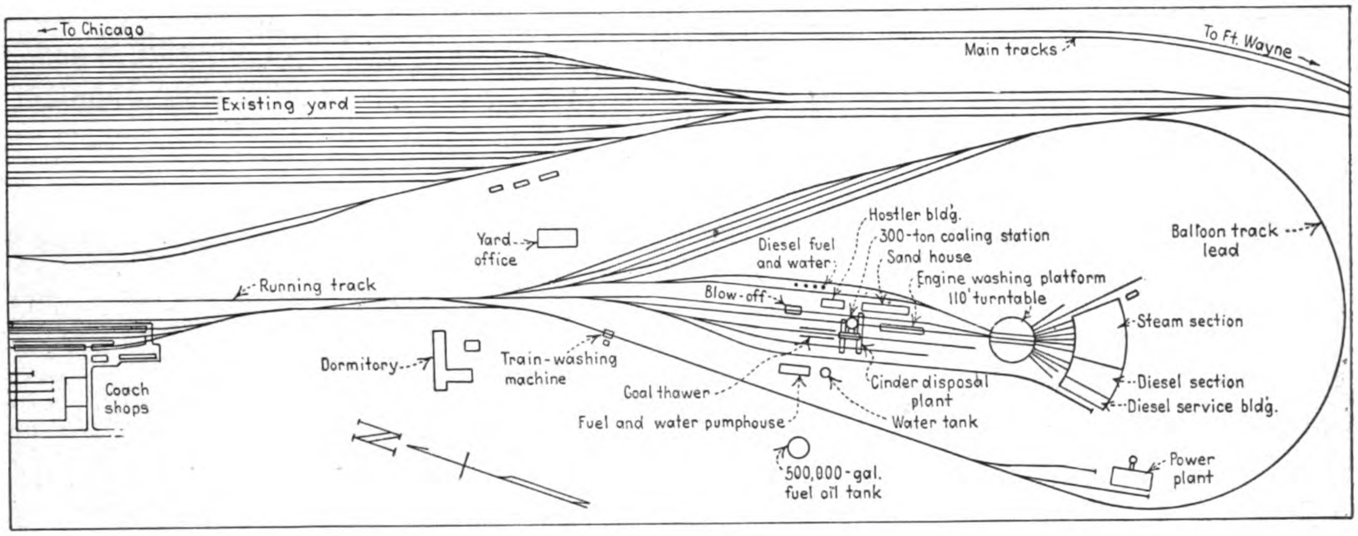
There is under construction a shop for the repair of passenger cars, a train and diesel locomotive washing facility, and a coach yard with related servicing facilities, which will add another $1 million to the cost of this project.

The new engine terminal is at the south end of the yard and is entered by locomotives from the north. After steam locomotives bring westbound trains into the yard, they are detached and move north to a running track, and then are run south on this track to enter the engine terminal. In the event that this running track should become blocked, the locomotives can be run south either over any one of 21 yard tracks or over the eastbound main track and then enter the terminal over a "balloon track" lead. The latter track loops around the engine terminal and will be used generally for turning passenger trains.

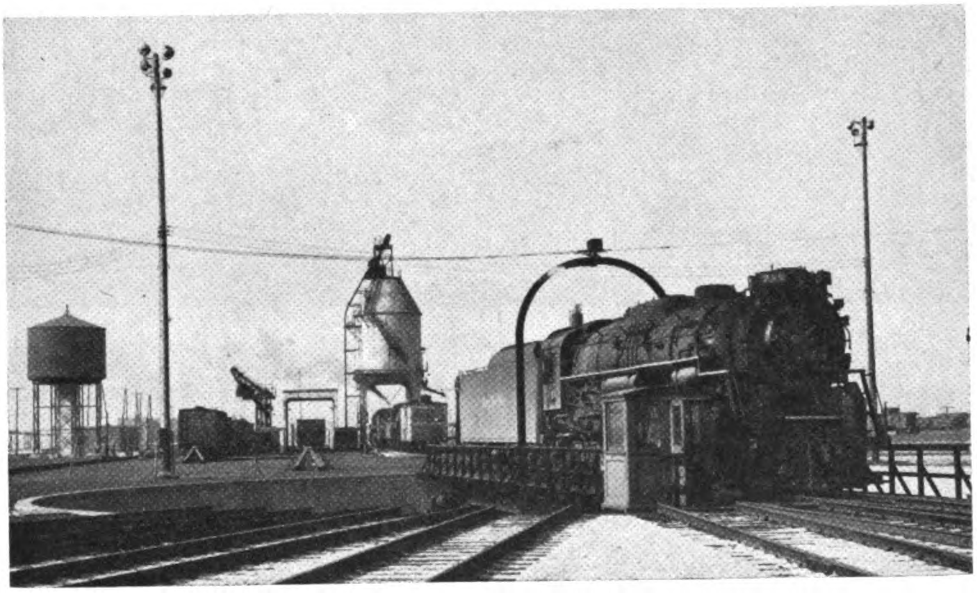
The enginehouse is divided by a brick fire wall into two sections—a steam section having six stalls, with tracks radiating from the turntable; and a diesel section with two radial tracks entering the building. Four other radial tracks were constructed outside of the building —a short wheel track and a longer material track serv-

CALUMET TERMINAL—DIESEL SHOP EQUIPMENT

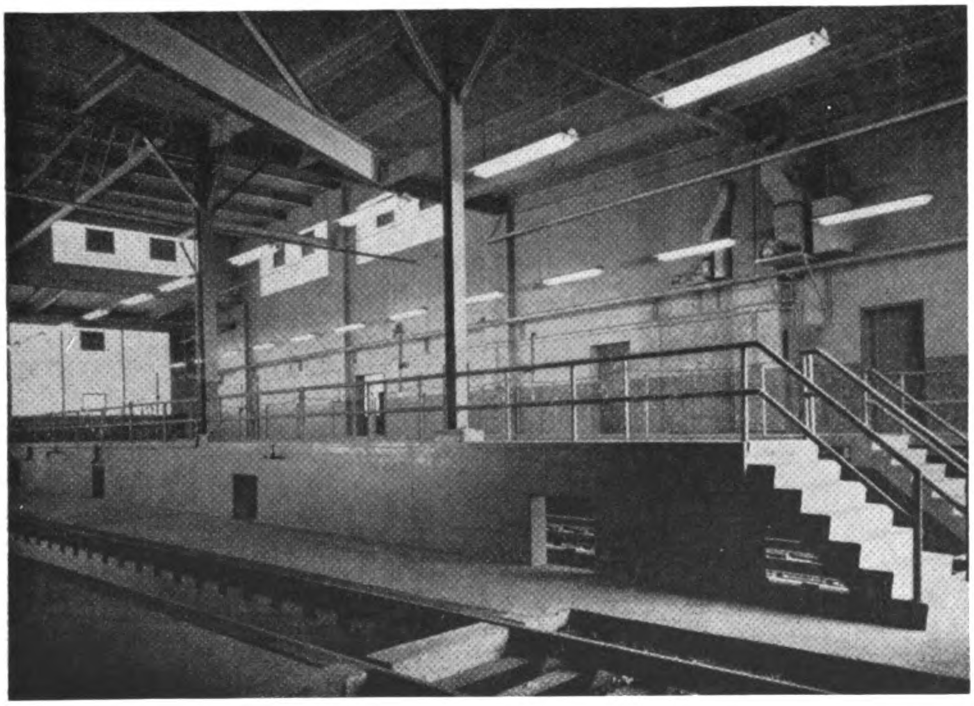
21-in. by 84-in. engine lathe
21-in. drill press
10-in. dry grinder
18-in. grinder—to come
1½-in. pipe threader
D.C. electric welder
4 40-ton electric jacks
1 5-ton jib crane
1 2-ton jib crane
1 traveling crane
Complete socket wrench set and cabinet
Electric drills with ¼-in. and ½-in. chucks and with with ¾-in. converter
Electric power wrench for crab nuts
Main bearing wrench set complete
Valve grinder-to come
Honing tool
Shop truck and six trailers



▲ Layout of tracks and buildings of the Nickel Plate's new Calumet locomotive terminal near Chicago.



➤ The turntable is of the three-point-support continuous type and is 110 ft. long. Behind the locomotive can be seen the reinforced concrete coaling station and coal-car unloading canopy. Immediately to the left of these is the skip hoist of the cinder-handling plant, while at the extreme left is the 100,000-gal. water tank.



◀ Large unit heaters heat the diesel-shop section. One directs its heated air downward through an underfloor concrete duct for supplying warm air to the depressed floor level and inspection pits. Since no testing of the diesel engines is carried out within the shop, gravity-type roof ventilators are installed. Mechanical servicing of the Nickel Plate's steam 2-8-4's requires 45 to 50 min. on the average

ing the steam section, and two short tracks, for wheels and trucks, serving the diesel section.

The two-track diesel section is designed to care for the fourteen 1,000-hp. E.M.D. switching locomotives stationed at Calumet yard, of which not more than one is permitted to be out of service at any one time. Each month, 13 monthly inspections and a little more than one annual inspection of these locomotives are made at the shop. Since it requires seven days to complete an annual inspection and one to complete a monthly inspection, the shop is fully occupied for 20 working days. The other one or two working days in most months serve as a cushion for handling unexpected repair work.

Generally, all diesel lecomotives that enter the diesel section are worked on track No. 1, the most westerly of the two tracks. The rails of this track are carried on concrete walls, with the tops of rails 4 ft. above a depressed floor level and pit. This track has an elevated service platform on each side. Parallel with, and adjacent to, the westerly platform is a two-level service building. The second track, which is assigned for truck work, is flush with the floor and has a 94-ft. inspection pit. It is flanked on its east side by a machine shop area served by 5-ton and 2-ton jib cranes.

The diesel service building is 27 ft. wide by 128 ft. long and on its main level, which is at the same elevation as the elevated platforms, there are a first-aid room, separate offices for the shop foreman and his clerical staff, a parts-cleaning room, an oil room, and a parts store room. On the lower level are an electric shop and battery room, another spare parts store room, an oil-storage room, and two locker and wash rooms. Ramps connect the two levels with the shop floor level so that mechanized material-handling equipment can be used.

Steam radiation heat is used in the rooms of the service building, while large steam unit heaters heat the diesel shop section. One large unit heater directs heated air downward through an underfloor concrete duct supplying warm air to the depressed floor level and the inspection pits.

The heaviest work done on the diesel engine consists of the removal and honing of the liners and the working of the cylinder assemblies. The shop is not equipped to remove crankshafts nor to replace engines and main generators, this work being performed at major repair points. Body work consists of minor straightening only.

Truck work consists of a wheel changeout every two years, and a wheel and traction motor changeout every four years. When this is done the motors are replaced by rebuilt units. Flat spots on wheels and other minor tread defects are removed by emery shoes and high flanges are reduced by use of brake-shoe cutting heads. Truck changeouts are handled by lifting the entire locomotive with four 50-ton high-lift electric jacks.

Electrical work done in this shop includes renewing defective parts in the control cabinets, overhauling small motors up to rewind work, and annual high-potential testing of all electrical equipment.

Air and oil filters, cylinder heads and liners, and oil coolers are cleaned in the parts-cleaning room, which contains four cleaning tanks, one rinsing tank and a table to dry and oil the filters. Lubricating oil changes are made in accordance with chemical tests only, and not on the basis of time or mileage. When the oil is found by test to be no longer suitable for service, it is drained and sent away for reclamation.

Parts removed for reconditioning, with the exception of traction motors, are reapplied to the same unit from which they were removed. One completely equipped spare truck, including the two traction motors, is kept on hand. Oversize parts are never used. For example, a liner scored to a depth which will not hone out is scrapped.

The principal equipment in the shop is listed in the accompanying table. The 5-ton jib crane, which has a 12-ft. radius, is situated at the turntable end of the truck track for handling traction motor replacement. This crane lifts the traction motor from the locomotive truck and transfers it to a highway truck used for hauling it to the rebuilding concern. The 2-ton jib crane is mounted on the wall at the other end of the truck track and has a 15-ft. radius with an air hoist. It covers the lathe area but eventually will also serve a shaper and a planer planned for installation for handling locomotive and car department work. An I beam also spans the track for a traveling crane with a 2-ton air hoist for removing radiators, auxiliary generatorsfi and batteries.

In this era of intensive dieselization, the Nickel Plate continues to maintain steam power properly and efficiently. Mechanical servicing of the modern 2-8-4's, which haul all the road's high-speed freight, requires only 45 to 50 minutes on the average, and this is for a thorough servicing job. This, coupled with a first-class monthly inspection and boiler wash performed at Bellevue, Ohio, permits these locomotives to operate continuously at virtually 100 per cent availability throughout the remainder of the month, and with road failures practically unknown. Except during cold weather, each of the Nickel Plate's modern steam locomotives enters the enginehouse less than one trip in ten.

The steam section of the new Calumet enginehouse includes six stalls 128 ft. long radially. The roof has a high bay, 5 ft. long, which is equipped with smoke jacks and stacks. Each stall has an inspection pit 4 ft. deep and 105 ft. long, and two of the pits are served by a 40-ton Whiting electric drop table for handling tender wheels.

This section is heated through the inspection pits by unit heaters. Boiler washout facilities, together with steam, hot-water and compressed air connections, are provided along all tracks.

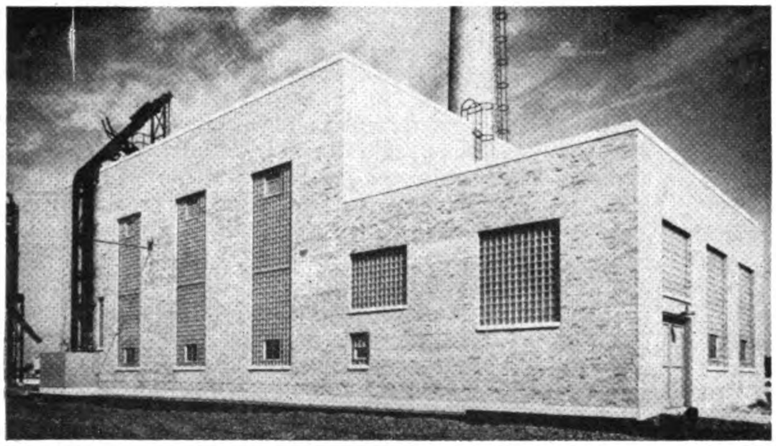
An average of 24 steam locomotives are serviced each day at Calumet. The servicing facilities are designed to expedite the work on locomotives backed into the inbound track, which is the normal position of the locomotives after bringing a westbound train into the yard. In the backed-up position the locomotives can take on sand and coal and have their ashpans cleaned in one stop. Moving forward to the washing platform, the engines take on water, are lubricated and boilers are blown.

On the outbound track, facilities are provided to enable steam locomotives to take on coal, sand and water, to have their ashpans cleaned and boilers blown, and to have train-control equipment tested.

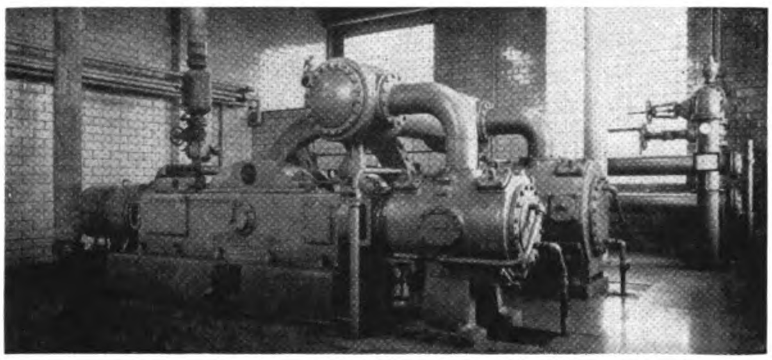
The coaling station is of the cylindrical-bin type, built of reinforced concrete, and has an overhead storage capacity of 300 tons. Cars of coal are spotted by an electric car puller under a canopy over an unloading hopper. Coal is dropped from the car into the hopper and received by a skip, which is hoisted up a runway to the top of the bin where it is tripped. The bin is loaded at the rate of 40 tons an hour. The coaling station serves both the inbound and outbound tracks, discharging at the rate of 22 tons in 10 minutes.

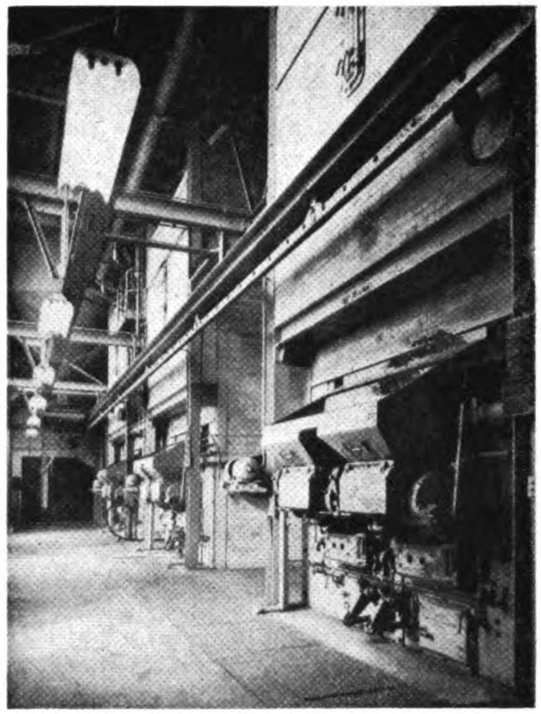
Thawer for Coal Cars

An adjunct to the coaling station is a facility for thawing frozen coal in cars. It embodies two masonry walls, about 11 ft. high, 84 ft. long, and 1 ft. apart, which



The high bay of the new power plant houses the boiler room and the low bay the air compressor. The skip hoist at the left carries coal from a track hopper to a 100-ton capacity steel bunker on the roof. The radial brick chimney rises 175 ft. above the ground. The air compressor (below) is steam driven and has a piston displacement of 2,200 cu. ft. per min. The compressed air is cooled by passing it through an innercooler and an after-cooler, using city water as a coolant, before it goes to an outside air-receiving tank.





▲ The boiler room contains three 350-hp. water-tube boilers designed for a pressure of 200 p.s.i. and a working pressure of 150 p.s.i. Coal is conveyed from the overhead bunker to the stokers by a weigh-lorry, which is electrically operated, on the overhead runway in front of the boilers. The firing and combustion of the boilers, which have an average efficiency of 80 per cent, are automatically controlled.

serve as wind shields. The walls are constructed of concrete building blocks. Six oil-fired thawing pots, lined with firebrick, are installed between the walls in the center of the track, and the heat from these burners is directed upward by compressed air.

The cinder-handling plant is also mechanical in operation and has two loading skip buckets. There are three ash hoppers at this point, two on the inbound track and one on the outbound, so that one of the skip buckets serves two tracks. As locomotive ashpans are cleaned the ashes are dropped into one of the hoppers and into a skip bucket. The skip is actuated by a push-button control. As the skip moves away in a tunnel beneath the tracks, it automatically closes a gate at the bottom of the hopper and then travels in a runway to be tripped in an elevated position for unloading into a car. It then returns to its position under the hopper, opening the gate as it arrives, and takes on another load.

The water-treating plant is a one-story building which houses, in addition to a soda-ash treating system, a chemical storage room, a room for diesel-fuel oil pumps, a bridge and building shop, an office, and a motor-car room. Water is taken from the city main, treated, and pumped to a 100,000-gal. wood storage tank erected outside of the building on steel supports. Treated water from the tank is piped only to the steam locomotive water columns; untreated water is used at all other points.

Diesel fuel oil is unloaded from cars spotted on the oil track, where four unloading apparatuses have been installed, and pumped either to the 500,000-gal. steel storage tank about 200 ft. west of the building, or directly into the service lines leading to the fueling station placed between the two diesel servicing tracks, to the coal-car thawing pots, and to the sand-dryer house.

The sanding station consists of a sand dryer and storage house and two sand towers, one for servicing both the inbound and outbound steam locomotive service tracks and the other for serving both the diesel road engine track and the diesel-switcher track. An unusual feature of this sanding station is its storage capacity—1,000 tons—which is more than a six months' supply.

A small dolly on a narrow-gage track hauls the sand from the storage to the dryer room. The sand dryer is an oil-fired unit of the rotary type, and has a capacity for drying 3 tons an hour. It is set below the floor level of the storage house to facilitate dumping the sand from the dolly. The sand-elevating drum is set lower than the dryer so that at no time is it necessary for the sand to be handled manually except in loading the dolly.

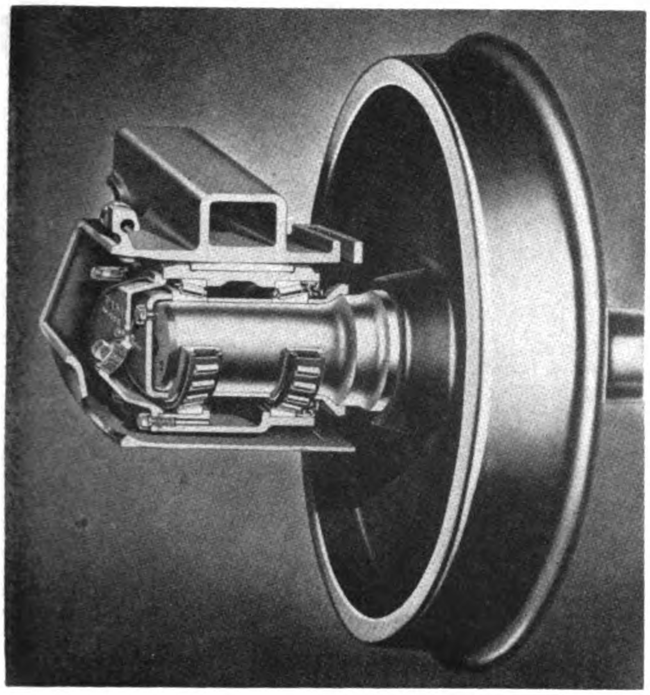
Modern Power Plant

The power plant includes a boiler house, approximately 47 ft. by 111 ft.; a coal hopper and skip hoist; a fly-ash collector; a radial brick chimney 175 ft. high and 7 ft. inside diameter at the top; and an ash-handling system.

Coal for the power plant is taken from a pit under the coal-car track adjacent to the boiler house and conveyed by a skip hoist, having a capacity of 25 to 30 tons of coal an hour, to a 100-ton capacity overhead steel bunker inside of the boiler house. From the bunker the coal is conveyed to the stoker by a weigh-lorry,

(*Continued on page 58*)

Fig. 1—Journal-box assembly in the integral box type truck side frame equipped with proposed standard axle journal



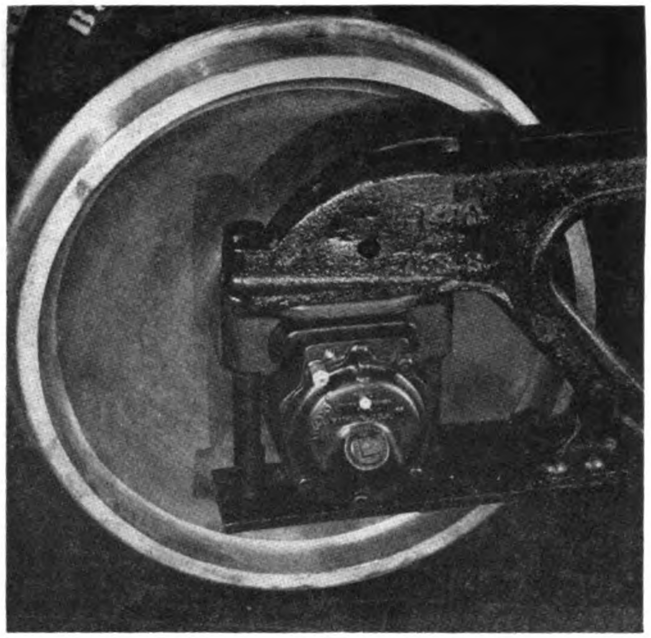


Fig. 2—Andrews type side frame with the same type cartridge journal box as shown in Fig. 1

Economics of Freight-Car Roller Bearings*

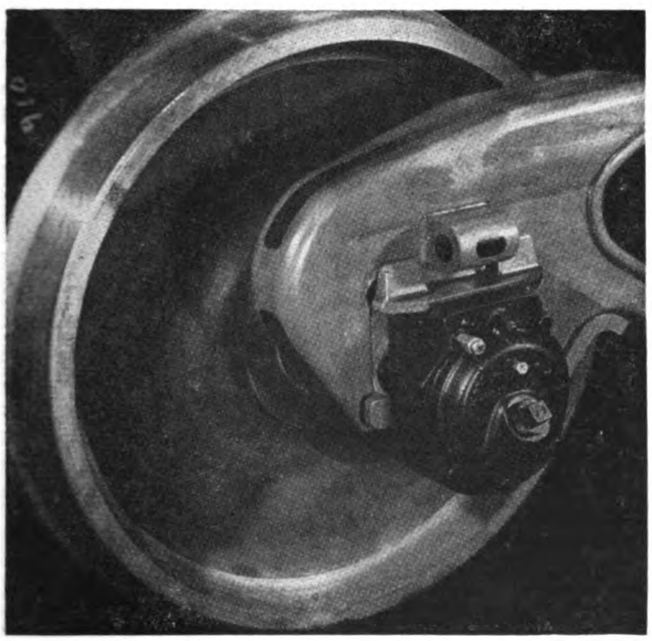


Fig. 3—Vulcan type frame with adapter between jaw opening and same type cartridge journal box as shown in Fig. 1

By Oscar J. Horger†

FOR some years it has been standard railroad practice to apply roller bearings to the axle journals of passenger cars and locomotives. This practice would have been extended to freight cars except for the doubt that existed in the minds of railroad officers as to the economics of roller bearings versus plain bearings on freight equipment. In fact, little data were available as to the operation and maintenance costs associated with the use of the plain bearings which increased the difficulties in making such an economic analysis. No analysis has heretofore been presented of the engineering requirements, costs, savings, and return on investment for roller bearings replacing plain bearings on all freight cars operating in interchange service. At the end of 1950 there was an ownership by Class I railroads of 1,744,625 cars plus an additional private ownership of 262,983 cars giving a total of 2,007,608 freight cars in interchange service.[1]

* Part I of a paper presented by the Railroad Division, American Society of Mechanical Engineers, at the annual meeting, Atlantic City, N. J., November 28, 1951. Part II will appear in the February issue.

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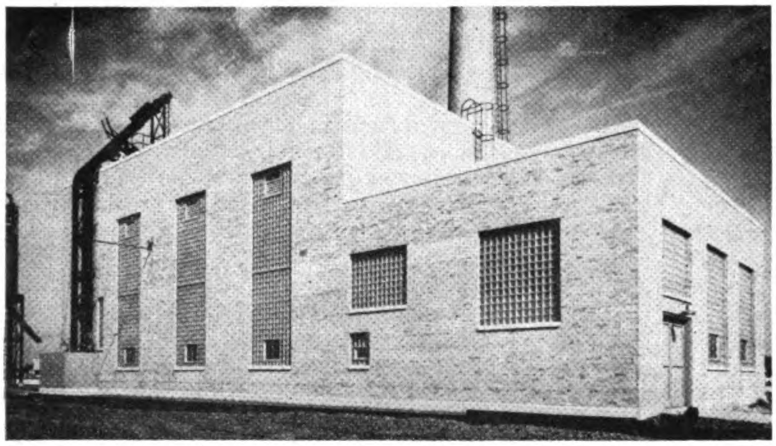

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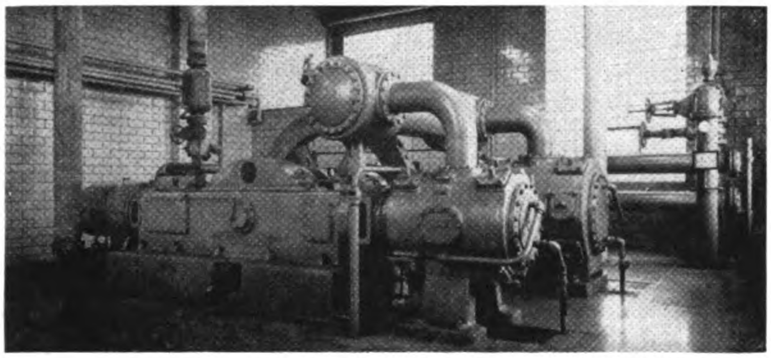

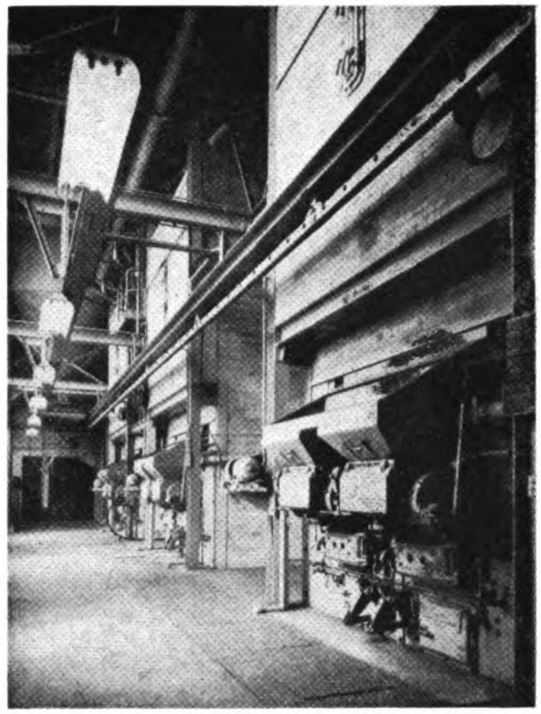

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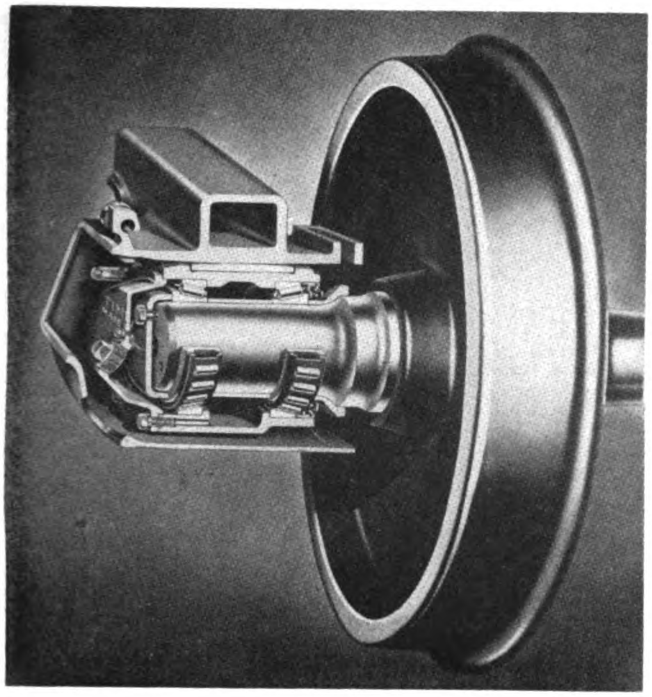

Fig. 1—Journal-box assembly in the integral box type truck side frame equipped with proposed standard axle journal

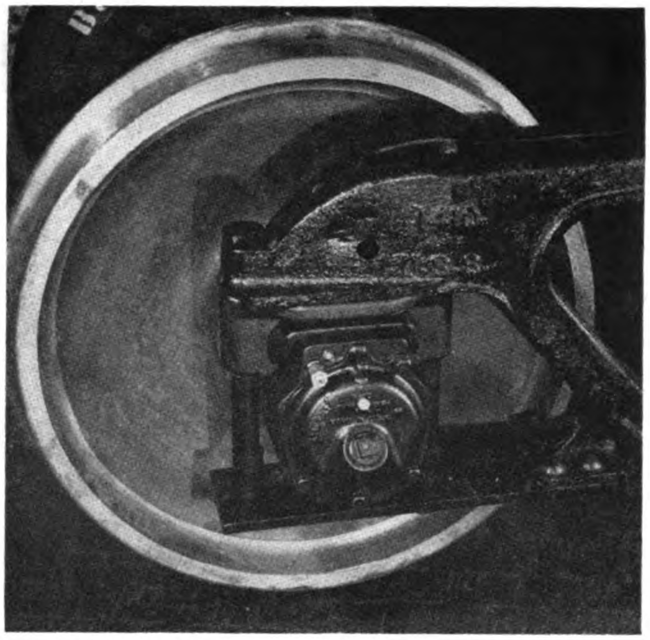

Fig. 2—Andrews type side frame with the same type cartridge journal box as shown in Fig. 1

Economics of Freight-Car Roller Bearings*

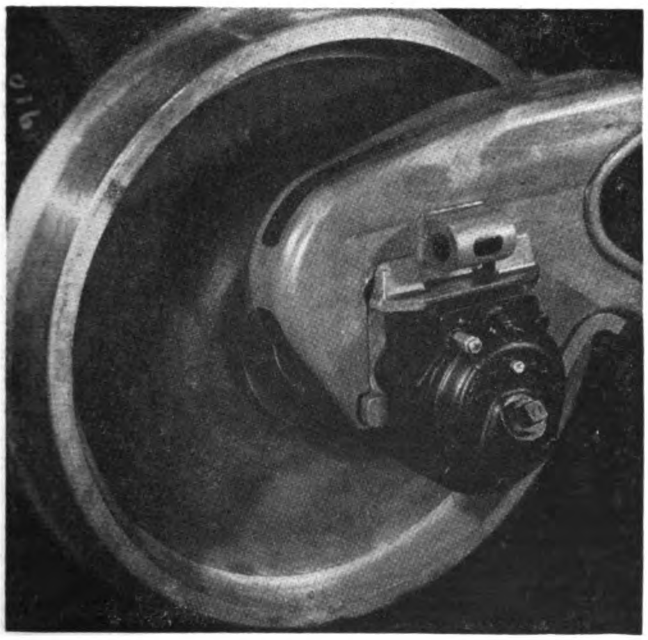

Fig. 3—Vulcan type frame with adapter between jaw opening and same type cartridge journal box as shown in Fig. 1

By Oscar J. Horger†

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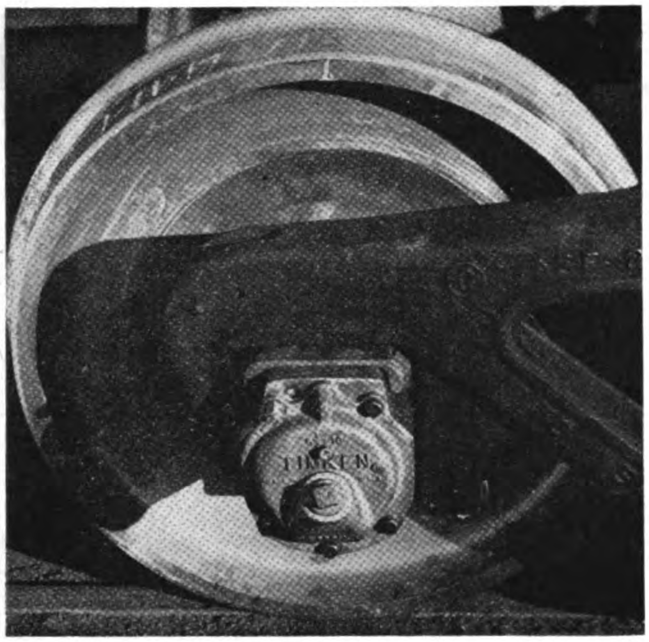


Fig. 4—Modified Vulcan frame for new cars using same type cartridge journal box as shown in Fig. 1

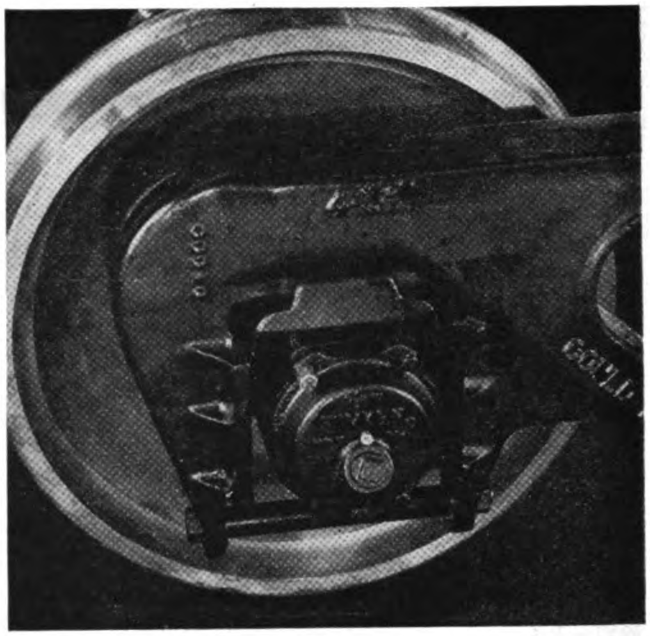


Fig. 5—Cartridge unit as shown in Fig. 1 in a pedestal type frame originally designed to receive a plain bearing passenger-car journal box

This is an economic study of the above problem and is submitted as a progress report. It is recognized that (a) such a complete bearing conversion program would require a substantial time period but ultimate investment returns are given here; (b) if individual railroads are to obtain the maximum benefits from roller bearings on system cars, which are off their lines a large percentage of the time, it is necessary that foreign cars received in interchange also have roller bearings; (c) some limited number of system cars on many railroads may generally operate in home territory or in routed interchange where many benefits of roller bearings could be obtained but this phase is not discussed here, and (d) the advantages must be sufficient to justify the joint action of all railroads in some progressive schedule of roller bearing application.

The analysis of this problem is divided into several major considerations so as to present an orderly development of this economic study as follows:

1. Only one design of journal box assembly for each axle capacity which will fit into any of the existing or new truck side frames. The axle journal to be standardized to receive the bearings of various manufacturers.
2. No bearing inspection or lubrication for three years in regular freight service at which time inspection will coincide with the required air brake inspection period.
3. Service performance data on journal bearings.
4. Cost factors associated with the maintenance and operation of both types of bearings and savings obtained.
5. Costs involved in the initial application of both types of bearings.
6. Return on investment.
7. Economic advantages of roller bearings not easily evaluated in dollars.
8. Conclusions.

Journal Design Conditions

Roller Bearing for Existing Cars. Practically all freight car trucks are now equipped with side frames of three general designs as to the method of attachment between the axle and frame: (a) integral box frame, (b) Andrews type, and (c) Vulcan type. It is intended that the same roller bearing cartridge journal box assembly[2] fit into any of these three designs as shown in Figs. 1, 2, and 3. A proposed standard design of axle journal is also shown in Fig. 1 which will receive any of the several types of roller bearings. Both the above axle and journal box designs will greatly simplify the maintenance of spare axle assemblies and stores stock.

The roller bearing journal, Fig. 1, on axles of various capacities may be machined from a worn plain bearing axle. Its diameter is $\frac{3}{16}$ in. above the condemning limit for the plain bearing journal on any axle size. Several years ago, fatigue tests were completed on full size members of this general design and the findings submitted to the Mechanical Division of the Association of American Railroads. On the basis of these tests approval was given to The Timken Roller Bearing Company for limited application of this axle to 5,000 cars until the roller bearing manufacturers could agree on a common journal geometry which would receive the bearings of various manufacturers.[3]

Roller Bearings for New Cars. In order to reduce initial costs on new cars and obtain the advantage of a quick whe:l change feature, it is proposed that the same cartridge unit, used on existing trucks, Figs. 1, 2, and 3, also be applied as shown in Fig. 4. Here the end of the side frame has a jaw opening contour identical to the inside dimensions of the present integral box frame. The jaw opening in Fig. 4 is less than for the Vulcan frame in Fig. 3 so that no strength difficulties would be expected in meeting static and dynamic test requirements on side frames. Present price schedules indicate about \$72 less per car[4] for the Vulcan than for the integral box frame. The quick wheel change feature on a plain bearing

[2] U.S. Patent 2,438,214, R. E. Horger, and others pending.

[3] The earlier design of this axle had a stepped journal of two different diameters instead of the uniform diameter in Fig. 1. The same journal fillet, axle diameter adjacent to fillet, and dust guard design on the stepped axle were used on the axle in Fig. 1. The critical design stresses are in this portion and the strength characteristics are not influenced by whether or not the diameter of the outer end of the journal is the same as that adjacent the journal fillet. Since this time the bearing manufacturers have agreeu on a common design of journal like Fig. 1.

[4] Based on 50-ton cars; this figure is over \$66 for 40-ton cars and over \$71 for 70-ton cars; for Vulcan frames and journal boxes this figure is over \$73 for 40-ton cars and over \$119 for 70-ton cars Actual costs may vary from scheduled prices.

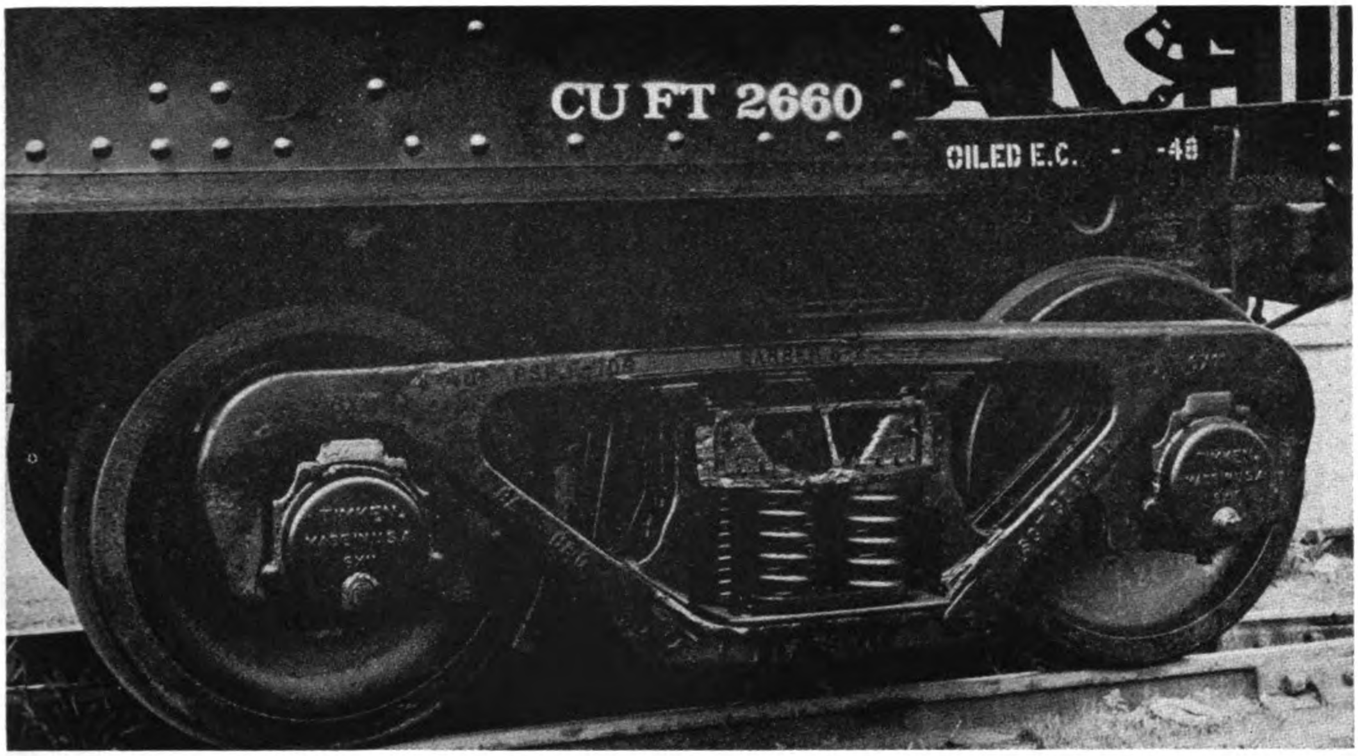


Fig. 6—A.A.R. pedestal type side frame with wide opening

truck using a Vulcan frame is only obtained at a premium of more than $83[4] above that for an integral box frame. This feature using the roller bearing, Fig. 4, is obtained at about $72 less per car[5] than for the construction in Fig. 1 which does not have the provisions for quick wheel change. An economic evaluation of this factor in changing wheels will be presented later in the paper. It is proposed that the A.A.R. Mechanical Division consider for standardization a frame jaw design similar to Fig. 4.

Freight car trucks have been designed around the conventional plain bearing journal box. There has been some consideration given to a redesign of the truck around the use of roller bearings so as to affect weight savings and lower costs. There are possibilities in this direction, but the interest along these lines has not been sufficiently aroused or intensive to promote the necessary engineering activity.

Roller Bearings for Other Cars. Another application of the same cartridge unit in Fig. 1 is illustrated in Fig. 5. Here the truck pedestal opening was designed to receive a plain bearing journal box used on passenger cars. A saddle member is interposed between the frame and box. A cost penalty is involved in the heavier frame jaw design and additional saddle member in Fig. 5 over Fig. 4, where the same journal box assembly is applied.

A.A.R. standards adopted in 1947 include the use of a pedestal type frame having a wide jaw opening[6] as shown in Fig. 6. The journal box assembly, frame jaw and axle journal are oversize considering operating requirements in ordinary freight service as compared with an adequate and less expensive design in Fig. 1 through Fig. 4.

Lubrication and Maintenance

The journal box in Fig. 1 is designed to operate on A.A.R. approved greases[7]. Great importance is attached to an adequate enclosure which will retain the lubricant and exclude foreign matter such as dirt, brine drippings, and water from entering the box. It is intended that this design will permit operation for a three year period in freight service without inspection of grease or making additions. Since periodical air brake inspection is scheduled every 36 months, then this work will coincide with the bearing lubrication period. This provision alone is the most important single factor responsible for immense economic savings presented later. It greatly reduces the large item of maintenance costs of plain bearings. It will also make many cars available for revenue service which are now on the repair track for bearing maintenance and periodical twelve month repack.

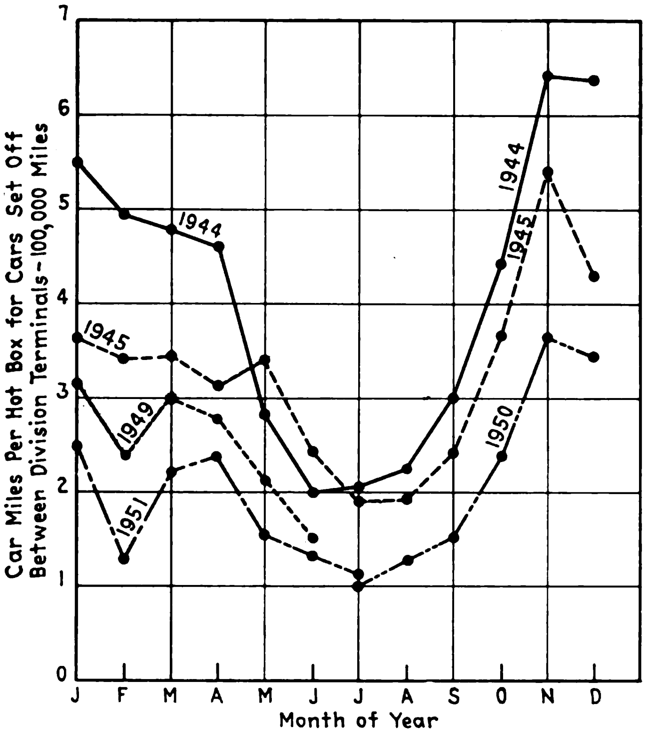
Grease will better protect the bearings than oil during periods of idleness. Also less leakage of grease will be experienced than oil. No moisture should be present in the box except that formed by condensation inside the box. The grease used has ample capacity for absorbing this small amount of moisture so it will not attack the bearing.

A unit seal assembly incorporating a rubbing type member of synthetic moulded material is applied at the rear of the box. It operates on a hardened steel sleeve ground to a 15 micro-inch maximum finish which makes it impossible to score or wear the axle. This enclosure is particularly effective in preventing contamination of the grease from fine particles of road dirt or dust from coal, cement or other kinds of lading carried in covered hopper cars. The journal box and wedge are die forgings of SAE 1035 and 1045 steel respectively. All these refinements contribute toward a long life in rugged service with three year lubrication periods.

Service Performance Data on Journal Bearings

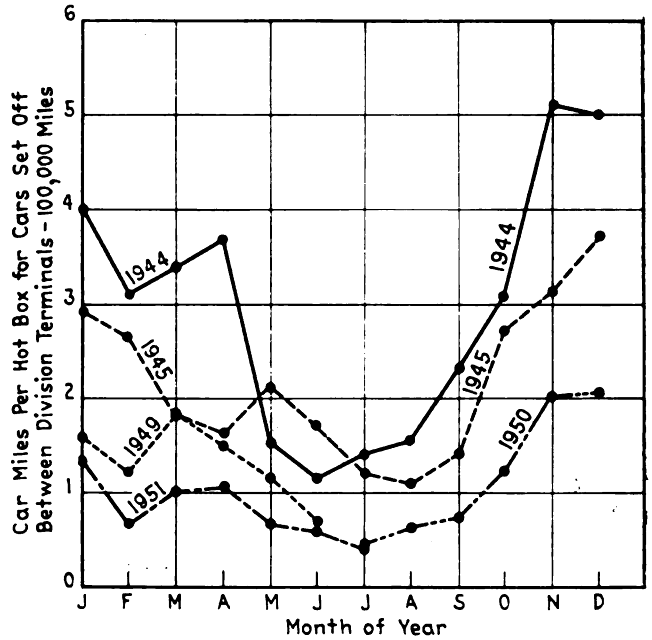
Cars Set Off Due to Hot Boxes. One measure in general use for showing bearing performance on freight cars is

[5] Based on 50-ton cars and assuming the price of the frame in Fig. 4 does not exceed that for the Vulcan frame in Fig. 3.
[6] Manual of Standard and Recommended Practice, D-12A-1948, Associated American Railroads, Chicago. Over 1,100 car sets of this design are in service.
[7] Code of Rules for the Interchange of Traffic, Supplement No. 2, 1950 Revision, p 4, rule 66-A, Associated American Railroads, Chicago.

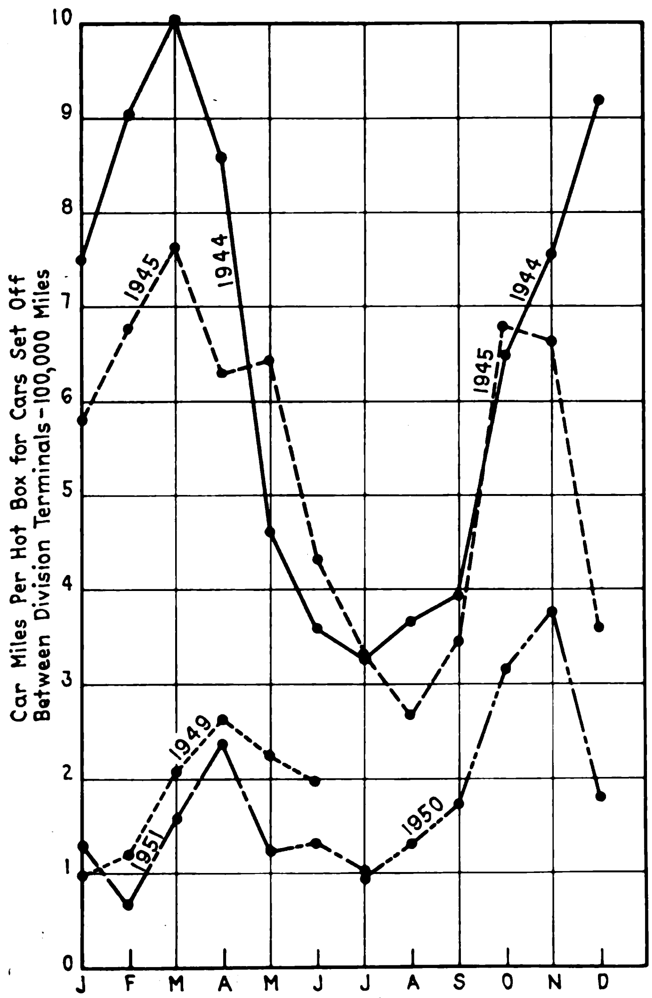


◄ Fig. 7—Plain bearing performance on freight cars of all Class I railroads

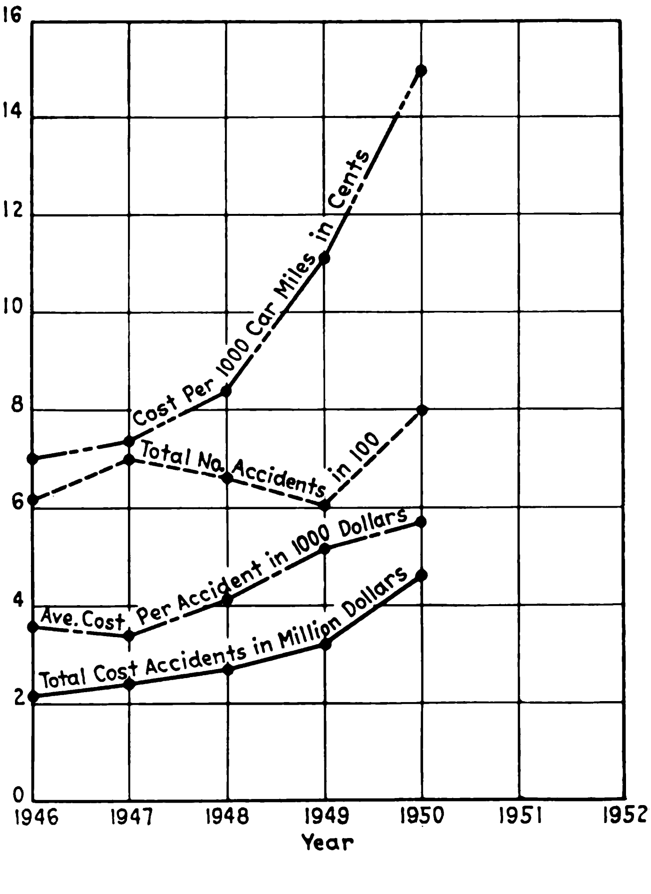
▼ Fig. 8—Plain bearing performance on freight cars on Railroad A



▼ Fig. 9—Plain bearing performance on freight cars on Railroad B



▼ Fig. 10—Reportable accidents to I.C.C. as a result of broken freight-car journals for all Class I railroads. Includes only the cost of repairs and clearing wreck



given by A.A.R. reports covering the car miles per hot box for cars set off between division terminals. A graph of this data[8] is plotted in Fig. 7 representing the average condition found with plain bearings on freight cars of all Class I railroads. A similar plot is shown for two large individual railroads[9] A and B in Fig. 8 and 9 which are typical of performance above and below the national average in Fig. 7; they do not represent the worst or the best operation. Two distinguishing characteristics are common to all these graphs in that (a) a continuous performance deterioration is occurring over the last several years, and (b) lower performance is marked in the hottest and coldest weather periods.

Some explanations which have been offered for the first item are (1) reduction in man-hours used in plain bearing journal box inspection due to 5 instead of 6 day work week and (2) the higher average speed of freight trains (stimulated by the increased use of diesel-electric locomotives) has led to serious wrecks from broken or burnt-off journals and on many railroads train crews have been made responsible with the result that more cars are set off rather than incur wrecks; with slower train speeds and frequent stops cars could be nursed into terminal.

Train movements have definitely changed in the last few years. Improved signal systems and operation of the same locomotive over several divisions, without fuel or water stops, gives cause for little delay and more continuous train operation. This is so marked that inspection forces complain of the lack of time allowed them at division points for the required plain bearing journal box inspection. Even the length of trains has increased so as to utilize the greater tractive effort of present day motive power so that it is more difficult to detect hot boxes.

Accidents Due to Broken Journals. The increasing seriousness of accidents from broken off plain bearing journals[10] is presented in Fig. 10. In 1950 it was costing an average of 14.9 cents per 1000 car miles which is more than double that in 1946. Furthermore, this cost only includes the items of repair to equipment and way and structures and clearing wreck; nothing is included for lading damage, detouring trains, train delays, injured and killed employees, etc. In this five year period four were killed and 86 injured in both freight and passenger train accidents due to broken journals, with most of the fatalities occurring in freight train service.

Few accidents have been reported on roller bearing axle journals on passenger cars, locomotives, or freight cars. Some roller bearing journals have burnt-off but no serious accidents have occurred. Some explanation may be offered for this: the end of the axle opposite the broken journal prevents the axle from getting out of the truck because the roller bearing completely surrounds this journal and tends to hold and stabilize the broken and fluttering end of the burnt-off journal in better truck alignment.

Performance Considering All Hot Boxes. Railroad C[10] obtained the mileage for cars set off between division terminals for hot boxes shown in Fig. 11 which is characteristic of that presented in Fig. 7-9. In addition, Railroad C also records the number of hot boxes which (a) cause train delay but where the car is not set off and (b) do not cause train delay but where it is necessary to change a brass or repack box[11]. A comparison of car mileage obtained from occurrences of Items (a) and (b) with that for set offs is given in Fig. 12 for one year of 1950. The lower curve in Fig. 12 is replotted in Fig. 13 along with similar curves for several other years. Much less change over the years is evident in Fig. 13 where all hot boxes are considered as contrasted with only the hot boxes causing set offs in Fig. 11. While Fig. 13 portrays the hot box record the car mileage shown would be still further reduced if the number of cars found without hot boxes but with cut journals, waste grabs and other kinds of defects requiring attention was included.

Journal packing is sometimes robbed from the box and in some localities this thievery reaches serious proportions. On one division of one railroad 100 cars were set off due to hot box condition during one year where the packing was found missing. This number represented 11 per cent of all cars set off.

Performance Considering All Bearing Defects. A still further criterion as to plain bearing performance can be found from a study of the number of axles removed from cars for cut journals alone and also the total number of cads having bearing defects.[12] Fig. 14 contains the results of such a study made from detailed records of two large railroads. For Railroad E[9] the average freight mileage was 98,000 car miles per pair of wheels removed for a cut journal as compared with 247,000 car miles per car set off between division terminals for a hot box and only 49,000 car miles per defective bearing; for Railroad F[9] this same comparison is 70,700, 121,000 and 45,000. It is interesting to observe that the car miles per bearing defect is very much the same (45,000 and 49,000) for these two roads even though car miles for cars set off and cut journals exhibit large variations.

Accurate data of the above character is not available without making a research into detail records. In view of the absence of more complete data, it was assumed in this economic study that all Class I railroads would have an average value of freight car miles for bearings and wheels as shown in Fig. 14. Here the values were selected from the known performance of Railroads E and F. Later the wheel performance values in Fig. 14 are used to evaluate the economics of a quick wheel change feature provided by roller bearings (Fig. 4).

Some railroads have a disproportionate and large percentage of hot boxes on cars in short haul traffic or which do not pass through points where journal boxes are serviced or on covered hoppers where the powdered nature of the lading contaminates the plain bearing assembly. In fact one railroad is currently applying roller bearings to over 1,000 pulpwood and covered hopper cars for these reasons.

Effect of Journal Load on Hot Boxes. Mitchell[13] obtained 115,000,000 car miles on the pacemaker freight cars operating in assigned service on the New York Central with nine recorded journal heatings of plain bearings over a certain period; over a later period 42,000,000 car miles were operated without a journal heating. He suggested several factors as affecting this performance which included reducing the capacity of the car from 50 to 25 tons whereas the actual average lading was only 12.5 tons. Other railroads have also obtained phenomenal plain bearing performance on some manifest or name freight trains where the average loading is low.

[8] Publication of this data was interrupted from time to time but graphs show data issued for all loaded and empty cars, and both foreign and system cars.

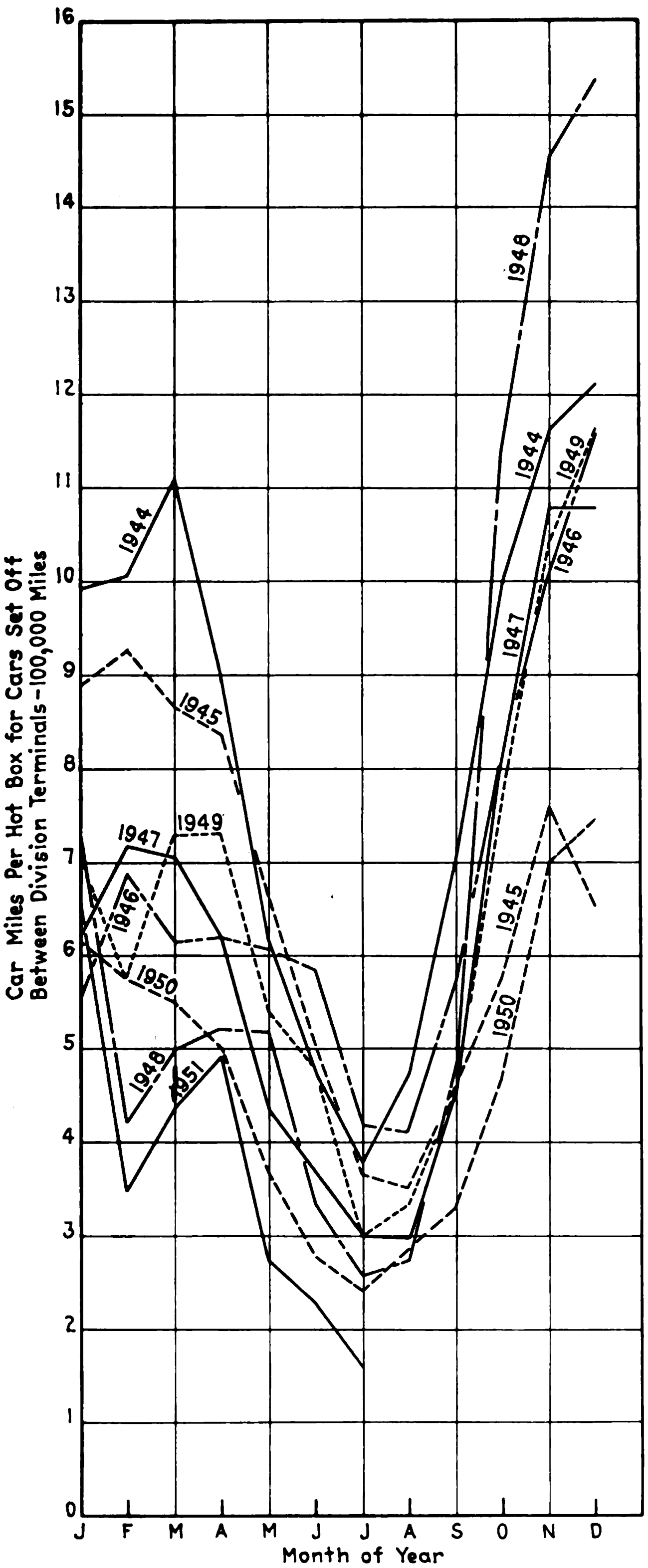
[9] Reference is made to individual railroads by letter throughout this paper because some of the railroads desired that their data be treated as confidential. Each of these railroads had over ¾ billion car-miles loaded and empty freight-car traffic.

[10] Data obtained from I.C.C. accident reports, code numbers 2419, 2420, and 2421 for broken journals on freight cars. These accounts only include accidents where costs exceeded $150 for years 1946 and 1947, $250 for 1948, and $275 for 1949 and 1950.

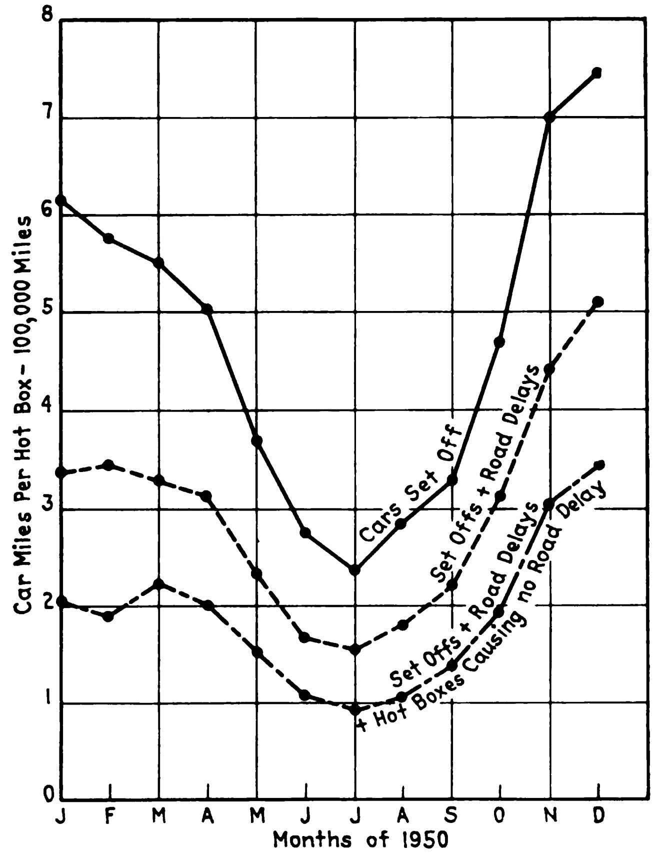
[11] In these figures no hot box is counted more than once on any division during the same trip even though it is necessary to repack or rebrass box more than once. Item (a) does not include cars set off and (b) does not include cars set off or those causing road delay.

[12] A defective bearing is defined here as one requiring attention other than periodical repack or other requirements under interchange rule 66 or yard and terminal inspection; it includes hot boxes, cut journals, and repack, rebrass or R & R (remove and replace) etc. because of improper bearing conditions found in service operation.

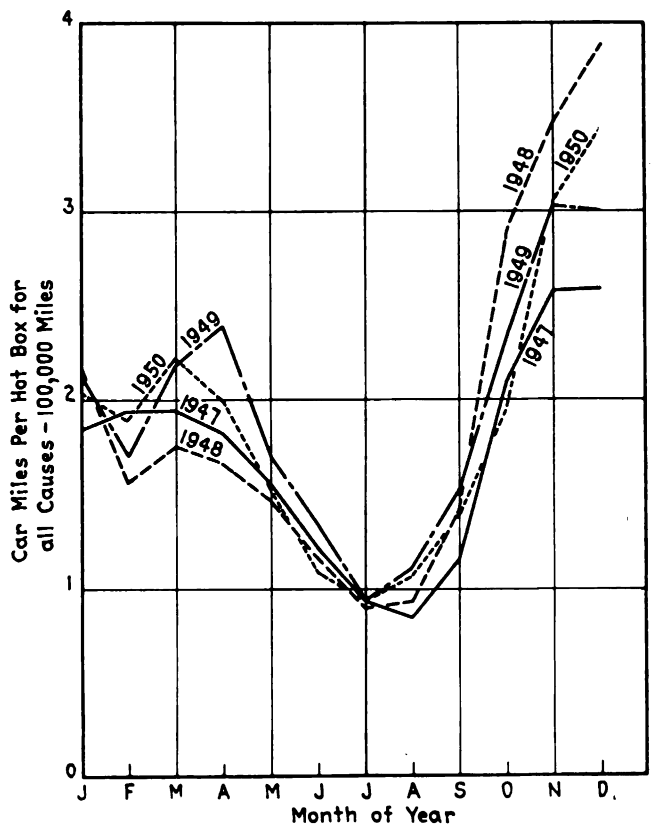
[13] F. K. Mitchell, "Lubrication and Hot Boxes," Proceedings Pacific Railway Club, V 33, July 1949, p 17-22.



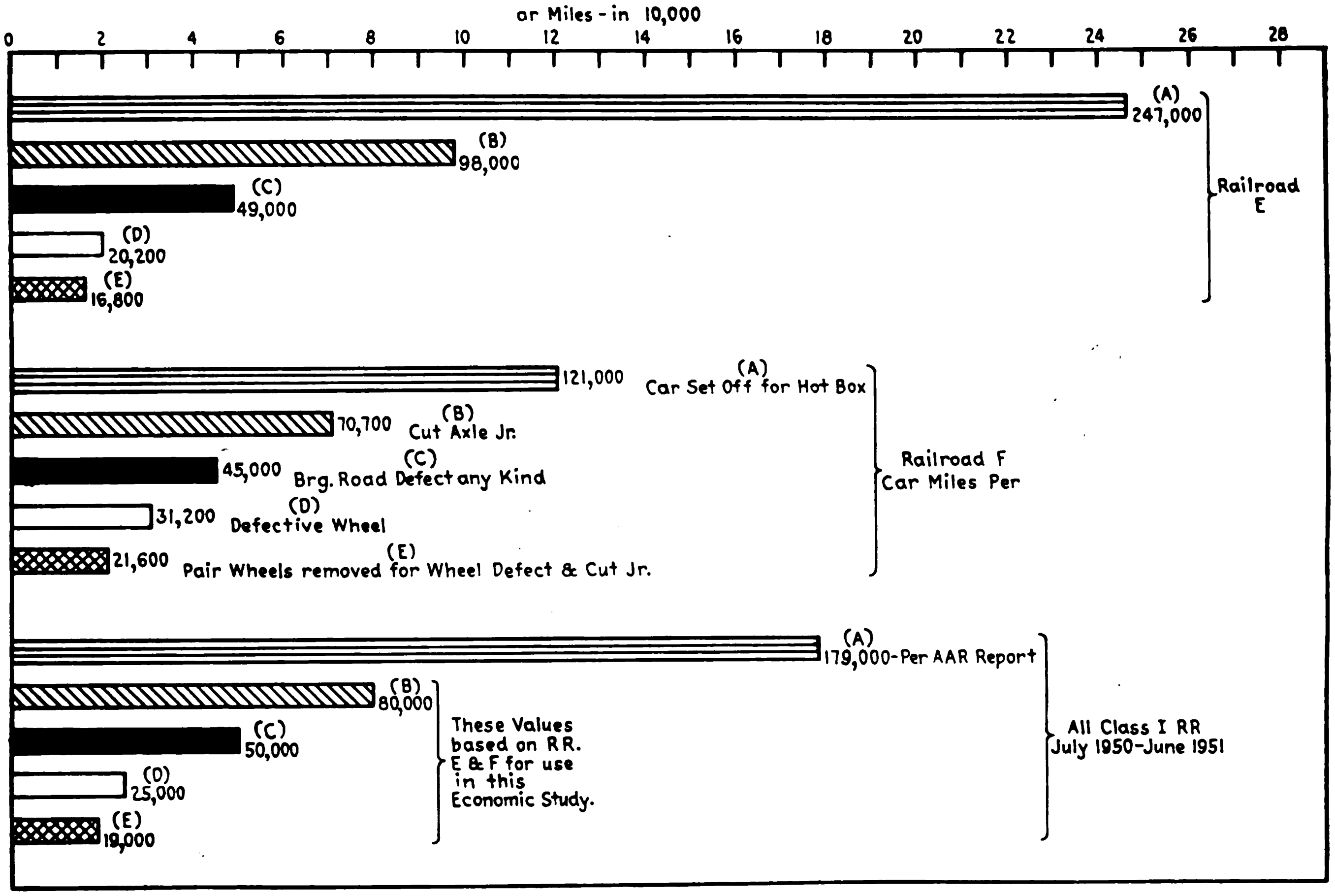
▲ Fig. 11—Plain bearing performance on freight cars on Railroad C



▲ Fig. 12—Freight car miles per hot-box separated between set offs, road delay, and others for Railroad C



➤ Fig. 13—Freight car miles per hot box using total number of hot boxes causing set offs, road delay or no delay for Railroad C. (Similar to lower curve in Fig. 12)



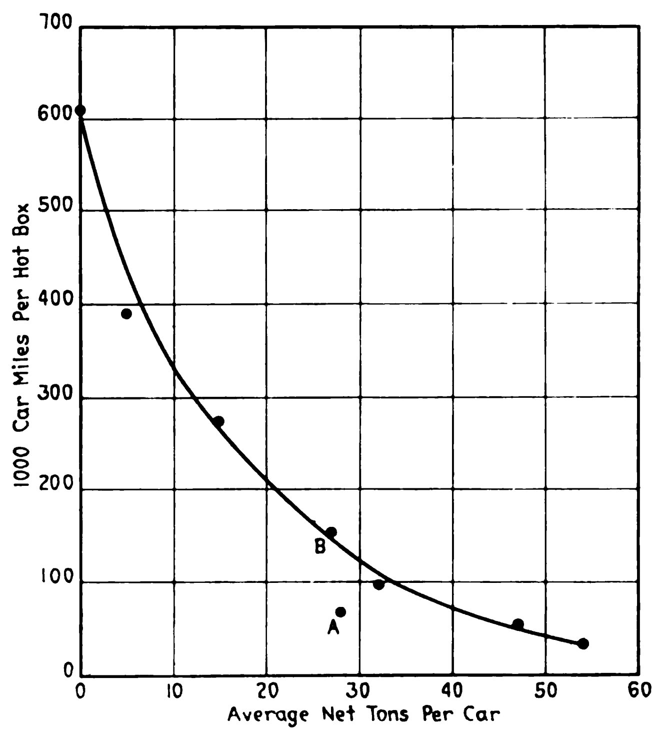
▲ **Fig. 14—Freight car performance data on plain bearings and wheels**

It is customary practice on many railroads to give cars in such trains more thorough inspection and servicing than given cars in other freight trains. It is common practice to assign men to these cars at loading docks where journal boxes are given attention over and above routine inspection. Furthermore, little switching is done on these cars and they do not pass through classification yards so that the packing and brass are not disturbed due to car impacts and reversal of direction of axle rotation. No mention is ever made of the extra costs involved in the special handling of these cars to obtain such phenomenal bearing performance records.

Regardless of the economic results of operating cars at some fraction of their normal rated capacity, so as to favor plain bearing performance, it is generally accepted that a reduced journal load is a very important factor in plain bearing operation. Fig. 15 shows the net or revenue load plotted against the car miles per hot box for 1624 cars set off between division terminals on Railroad D. Here the net loads in these cars varied from no load to full load but were arbitrarily grouped in ten ton loading ranges for purposes of plotting this curve. Except for point *A* in Fig. 15 a systematic deterioration in bearing performance results with increasing journal load. Point *A* includes about one-third tank cars and when these cars are omitted from the calculation then Point *B* is obtained which falls on the curve.

Shoemaker[14] reported that of 1,900 cars set off due to hot boxes substantially all of them were loaded cars. Additional data on another Railroad G[9] gave 74 per cent of cars set off were heavy loads, 20 per cent were light loads, and 6 per cent were empties. On one railroad

▼ **Fig. 15—Effect of weight of lading in freight cars on hot boxes causing set offs between division terminals. Based on 1,624 cars set off on Railroad D**



[14] Perry M. Shoemaker, "The Railroads' Journal Bearing Problem," Proceedings New York Railway Club, October 20, 1949.

where loaded coal car represented about 11 per cent of the system mileage for loaded cars it was found that 30 per cent of the cars set off for hot boxes in one year were cars loaded with coal. In another case about 11 per cent of the cars set off for one year were loaded with sand, gravel, stone, or pulpwood even though this traffic was only slightly over 1 per cent of total loaded car miles for the system.

Again overloaded cars and misplaced or shifted lading increases the load on one or more journals and are advanced as causes for overheated plain bearings. Even under ideal operating conditions in the A.A.R. laboratory tests[15] of the conventional waste packed bearing numerous failures developed under 16,375 lb. static journal load on 5½ in. by 10 in. axle; 11 bearings failed in 20 test series where the same brasses were used from one test to another after rebroaching; 8 bearings failed in 9 test series where new brasses were used in each series.

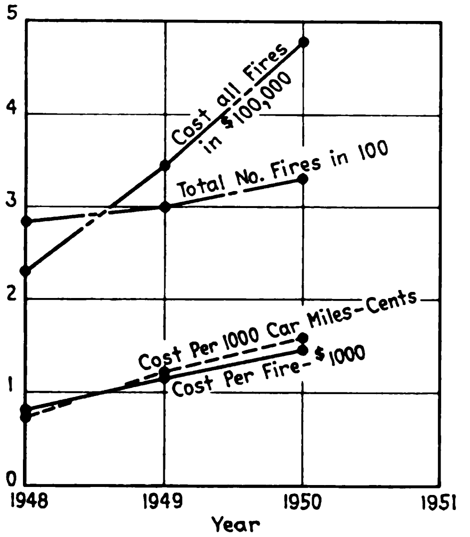


Fig. 16—Cost of fires due to overheated plain bearings on freight cars of all Class I railroads

The railroads in the Pocahontas region hauling coal generally have considerably better hot box performance from the standpoint of cars set off than most of the other roads. Their record is often submitted as an example of what can be done and to refute the findings in Fig. 15. The records of these coal roads may be explained by such factors as (1) generally a higher density of traffic which permits them to support and concentrate more expense on journal box maintenance; (2) a larger percentage of system cars remain on their lines or in routed interchange; (3) a smaller proportion of foreign cars is handled; (4) they do not receive much traffic from many interchange points where inspectors are not maintained, and (5) they have little short haul traffic.

Fire Losses Due to Overheated Bearings. Overheated plain bearings on freight cars lead to considerable fire damage and destruction to cars and contents. The number of these fires and their costs are given for three years[16] in Fig. 16. While this economic loss was only 1.59 cents per 1,000 car miles in 1950 it was over twice the cost in 1948. An A.A.R. report[16] states with reference to eliminating these fires "an ultimate remedy would be the replacement of the present type of bearings with roller bearings——."

TABLE 1—MILEAGE RECORD ON SOME ROLLER BEARING EQUIPPED FREIGHT CARS

Railroad	Number of cars	Type car	Car miles accumulated estimated
1	800	50-ton stock	85,375,000
1	9	50 ton box	4,904,000
2	5	50-ton box	527,000
3	1,000	70-ton hopper	38,694,000
4	50	50-ton box	1,312,000
5	40	50-ton box	11,706,000
6	10	50-ton box	951,000
6	12	70-ton cover hopper	6,200,000
7	20	70-ton ore	800,000
7	48	50-ton box	8,706,000
8	10	70-ton hopper	120,000
9	21	70-ton cover hopper	1,103,000
9	400	70-ton cover hopper	3,000,000
10	77	70-ton cover hopper	2,367,000
10	6	Caboose cars	484,000
11	20	Caboose cars	822,000
Total	2,528		167,071,000

TABLE 2—WEIGHT COMPARISON OF ROLLER BEARING AND PLAIN BEARING EQUIPPED CARS 50 TON CAPACITY

Type of truck side frame on		Increased or decreased weight of roller bearing application over plain bearing per car, lbs.
Roller bearing	Plain bearing	
Integral box-Fig. 1	Integral box	112 increase
Integral box—Fig. 1	Vulcan	336 decrease
Modified vulcan—Fig. 4	Integral box	272 decrease
Modified vulcan—Fig. 4	Vulcan	720 decrease
Andrews—Fig. 2	Andrews	320 decrease
Vulcan—Fig. 3	Vulcan	422 decrease

Performance of Roller Bearings. A record of 167,071,000 car miles is exhibited in Table 1 for 2,528 freight cars equipped with roller bearings on twelve different railroads. Only one hot box has developed in this mileage and no other cars have been set off between or at division terminals. In this economic study a value of 15 million car miles per hot box (including those causing set off, road delay or no delay) is used. This value is conservative considering the above record on freight cars and still greater mileage experience on passenger cars and locomotives. It is further calculated in this study that after the bearings have been in service for many years that the average yearly replacement will be 3 per cent as determined by inspection at the time wheels are replaced.

In addition to the above freight cars there are 625 cars being currently equipped. Also 550 express refrigerator cars have been in service for over 3.9 years and 258 freight cars on one foreign railroad operating through desert territory. Privately owned cars, not shown, also total 3,068 cars operating on various industrial or mining properties.

Weight Comparison. It is too often assumed that the roller bearing application represents a considerable increase in weight over the plain bearing. This assumption is not only erroneous but the reverse is often the case from a consideration of the actual weights presented in Table 2. Here it is shown that a reduction in weight of 272 lb. accompanies the roller bearing on new cars (Fig. 4) if compared with the integral box frame with plain bearings; a reduction of 720 lb. if compared with the Vulcan frame with plain bearings.

Friction. This economic study does not attempt to evaluate any differences in the frictional characteristics of the two types of bearings. Laboratory test results are often submitted to prove some contention, but such findings are based on a static radial loading with no application of (a) dynamic loading, (b) lateral forces, or (c) displacements which take place in the bearing under service conditions. It is well known that a radially loaded plain bearing which has established an oil film of clean oil and reached equilibrium temperature presents good frictional values. We are all familiar with the really successful plain bearings in various industrial or marine

[15] Exploratory Tests to Establish the Functional Characteristics of Truly All Year New and Renovated Car Oils, Fifth Progress Report, October 5, 1950, Associated American Railroads, Chicago.
[16] Fire Protection and Insurance Section, No. 115, June 1949; Nos. 119-120, June-September 1950; Nos. 123, June 1951; Associated American Railroad, Chicago.

applications where provisions for reliability of service results in a cost comparable or even exceeding that of the roller bearing.

The conventional waste packed bearing operating on freight cars has little resemblance to an adequate design of plain bearing. It invariably (a) operates on boundary lubrication, (b) uses an oil practically unprotected from contamination by road dirt and water by inefficient dust guards and journal box lids, (c) requires imposition of lower maximum train speeds by time table authority, and (d) has a reliability factor of such low order that over 90 per cent of the mechanical failures occurring on 90,000 freight cars were found to be bearing failures. So when laboratory tests[15] are made with waste packed bearings under ideal conditions, it is not difficult to find low frictional values. Various attempts to improve the plain bearing by using separate sleeves on the axle, improved dust guards, and tight lids, waste retainers, pad and pump lubrication, and other means may contribute to improved operation, but the desired performance requires ultimate design changes and costs which has led all other types of industries to the adoption of roller bearings.

Actual road tests by several Class I railroads on passenger[17] and freight[18] trains have evaluated the frictional resistance of the two types of bearings. These investigations leave no doubt concerning the greatly reduced starting effort in favor of the roller bearings.

[17] "Rolling Resistance of Freight and Passenger Cars Equipped with Roller Bearings," Report on Assignment 9, American Railway Engineering Association, 1949, page 206-209 which states "Timken, Hyatt, Fafnir, and SKF are the principal suppliers of roller bearings for railroad cars; however, Timken is the only company having freight-car applications up to this time." Claims that other companies had applications on freight cars were checked and found to be on box cars equipped with high-speed trucks and assigned exclusively to head-end service on passenger trains.

[18] "Roller Bearings for Freight Cars," Report of the Mechanical Advisory Committee to the Federal Coordinator of Transportation, Associated American Railroads, 1935.

[20] "Draft Gear Maintenance", G. Q. Lewis, Car Foreman's Association, April 13, 1942.

[21] Mastering Momentum, Lewis K. Sillcox, Simmons-Boardman Publishing Corporation, 1941.

[22] "Protection of Lading and Equipment", P. W. Kiefer, Mechanical Engineering, Volume 70, December, 1948, P. 1018.

Further evidence of this is apparent on passenger trains where slack between the coupled cars is virtually eliminated and required roller bearings on the cars to facilitate an easy and impact free start. This reduced starting effort permits increased acceleration of the train and without rolling the packing so as to invite waste grabs characteristic of the plain bearing under rapid acceleration. Since the starting of plain bearing equipped freight trains depends upon serially starting coupled cars, it is necessary to provide a certain amount of slack in the couplings, which requires maintenance to stay within proper limits. Difficulty is experienced at speeds of several miles per hour when the slack permits groups of cars to be jerked or strike other groups of cars or at higher speeds when internal collision or impact also occurs between cars. This question of slack has been discussed in the literature from the standpoint of draft gear failures, maintenance, operation, and lading damage.[19, 20, 21] Roller bearings will permit the reduction of slack in the couplings between freight cars; while no operating data are presently available, it is logical to expect material improvement in the above deficiencies present with plain bearings.

These road tests further showed a reduction in friction at all speeds in favor of the roller bearing except one series of freight tests[18] at 10 mph. there was a slight difference in favor of the plain bearing. Otherwise the freight car tests showed the following reduction in train resistance in favor of roller bearings:

(a) Summer tests—first 10 to 20 miles of train operation 10 to 35 per cent reduction.

(b) Summer tests—after running cars 10 to 20 miles equilibrium bearing temperatures were reached and here the reduction was 5 to 15 per cent.

(c) Winter tests—first 10 to 20 miles 23 to 25 per cent.

(d) Winter tests—after running cars 10 to 20 miles 4 to 18 per cent.

(To be concluded in February issue)

One of 100 covered hopper cars recently delivered by the American Car & Foundry Co. from its plant at Berwick, Pa.

Aligning Diesel Main Bearings with a Transit*

The use of an engineer's transit, by lining up an inside micrometer with the horizontal cross hair, makes possible precision measurements that result in better engine performance.

ALTHOUGH misalignment of main bearing bores is more critical in some makes of engines than in others, there are limits of misalignment common to all makes that must be observed. These bore variations are small and hard to find. Constant and repeated checking may fail to show any unusual condition but still certain bearings in the engine constantly wear out before the others, throwing an unnatural load on the remainder and shortening the life of all the main bearings. With the offending engine steadily wearing out its main bearings, low main-bearing oil pressure difficulties constantly appear on the work reports. If the path of least resistance is followed, only those main bearings showing excessive wear will be changed out in a desperate endeavor to keep the locomotive in service and the whole affair will culminate in a broken crankshaft or one that is scored or overheated.

An engine that fits into the above sequence of events indicates that some of its main bearing bores are not parallel and are not in line with each other.

Fig. 1 shows schematically just what kind of a main-bearing condition can exist without the slightest chance of its being caught by using an inside micrometer.

All of the bores, 1 through 7, can mike the same (note dimension X), with variations of only one-half thousandth between them. Yet main bearings Nos. 2 and 3 can be drifting off up into the case of the engine, actually resulting in a center misalignment as shown at *B* and *A*. Main bearing No. 4 can be back precisely on line but notice the step in bearing centers between 3 and 4. The crankshaft will try to run in a straight line so that the bearing loads on the caps at 2 and 3 will be very high, resulting here in poor bearing life. Worse yet, every time the crankshaft revolves it undergoes a complete cycle of flexure which, at the rate of 700 or 800 r.p.m., will fatigue the shaft, starting a progressive crack. If the offset between adjacent bearing bores is severe enough and the rotative speed of the crankshaft is high enough, these two conditions can and will result in a harmonic vibration being set up in the crankshaft that will fail the shaft in a surprisingly short length of time.

Bearings No. 5 and 6 can mike perfectly with an inside mike although the bearings are cocked. The centers of main bearings 5 and 6 are not badly off the true centerline but the fact that they are cocked puts a dog-leg in the shaft. Inside micrometer readings, no matter how carefully taken by the best machinist in the shop, will not indicate the dismal main bearing alignment condition shown at the top of Fig. 1. Some means must be found to reference the center of one main bearing with the center of its neighbor or the true condition of any set of crankshaft main bearings is pure conjecture. Engines have been found with all of the main bearing misalignments shown on this sketch. These engines after reboring with the aid of a transit are rolling up main-bearing life previously thought impossible.

Careful examination of the main-bearing shells removed from a diesel engine suspected of main-bearing misalignment is only an approximate indicator of main-bearing alignment. If the main-bearing shells are examined before any gaulling or cutting has taken place, it is possible to trace a high cap bore by the fact that the half of the shell in that cap will be thinner than its neighbors.

Careful bearing examination can sometimes reveal the presence of a cocked bore by examining both the upper and lower shells of the bearings and looking for excessive wearing or marking at diagonally opposite edges. This is quite difficult to see as too often this cocked condition results in tearing up the shell surfaces after only a few minutes of running time with new shells. In one case an engine was in for constantly reoccurring low main-bearing oil pressure and was given a very close main-bearing examination. No evidence of cocked bearings could be found from examination of the main-bearing shells although transit work subsequently showed that a number of the main bearing bores were cocked. The principal reason for deciding to rebore this machine was the pronounced evidence of the dropping of the crankshaft down into the lower shells and the fact that as the shaft dropped, it slid off to one side.

How the Transit Is Used

If an engineer's transit is set up, as shown at the bottom of Fig. 1, and its line of sight centered so that it lies equidistant from the crowns of No. 1 and No. 7 bearings, dimension *X*, a true alignment picture of the crown of each bearing may be had. One end of an inside micrometer is held at the exact center of the crown of any main bearing and the length of the micrometer is adjusted until the end of the micrometer barrel just touches the crosshair on the transit. With a little practice the accuracy of this method is assured because:

1. A line of sight does not bend and hence is a true comparator.
2. A line of sight has no thickness and the shadow of the enlarged end of the micrometer can be adjusted until it just touches the vertical crosshair in the field of the instrument.
3. By adjusting the instrument so that dimension *X*

*Abstract of a paper delivered before the December meeting of the Chicago Railroad Diesel Club by E. H. Weston, assistant chief mechanical engineer, Chicago & North Western.

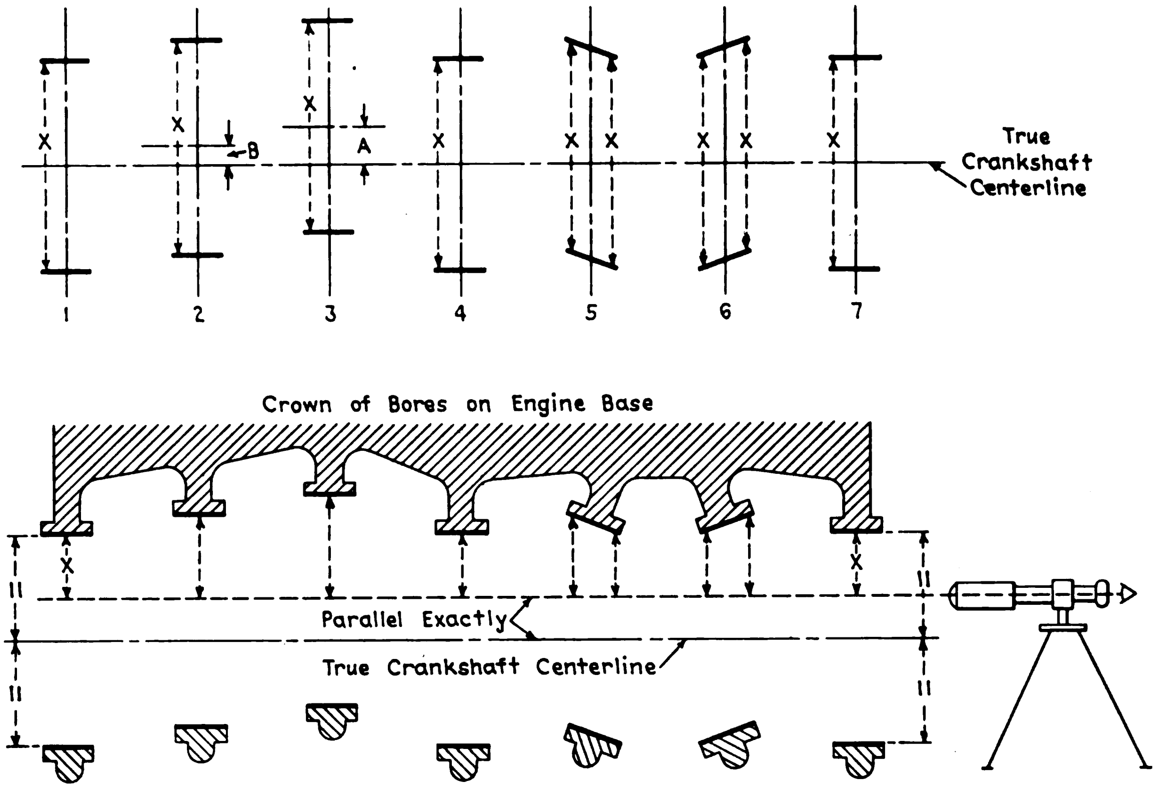


Fig. 1—Misaligned main-bearing condition that would not be caught with inside micrometers

is obtained at either end main bearing, a line of sight is produced that is absolutely parallel to the crankshaft centerline.

Catching a cocked main bearing now is no problem for either edge of the crowns of all main bearings can be miked to the line of sight and variations in reading of the micrometer will tell the story in a positive manner.

In making preparations to use an engineer's transit to run over the main bearings on a diesel engine, the engine is split and removed from the diesel unit and is laid upon its side. A precise hand level with a bubble tube having graduations of one-half thousandths per foot should be used to level the engine case exactly both longitudinally and laterally. The leveling of the engine case is very important and contributes greatly to the accuracy of subsequent measurements. Neither a combination square bubble nor a carpenter's level is anywhere near accurate enough for this work. If transit work should carry over from one day to the next, the engine case should be again checked for level and any settlement corrected before any more measurements are made.

The center of each main-bearing crown should be carefully scribed on the crown of the bearings. Since micrometer masurements are to be made at either edge of each crown, some convenient amount should be marked on the scribed crown centerline in from either edge and this dimension transferred to the other bearings. A small jig as shown in Fig. 1 can be made to assist in holding the micrometer steady and perpendicular to the surface to be miked.

To make measurements horizontal to the plane of the engine, lines may be scribed on each main bearing bore equidistant from the split of each bearing and the micrometer set in a second jig to insure its being kept perpendicular to the bearing bore. In the photograph a slightly different aspect of this type of measurement is shown in that measurements are made from the inside face of the toes used to align the main bearing caps on this particular type of diesel engine.

Fig. 4 shows the engineer's transit set up ready to start work. The transit has a vertical motion that allows the telescope to be tilted up or down without disturbing lateral adjustment and this motion permits looking at the micrometer ends at any bearing even though the instrument may be lower than the centers of the bearings.

The instrument is adjusted first by eye and then two micrometer measurements are made at the crown of the nearest main bearing and at the crown of the farthest main bearing. The instrument is adjusted horizontally by adjusting screws and by small amounts of rotation of the transit body until the micrometer readings at the nearest and farthest main bearing crowns are identical (dimension *X* in the lower part of Fig. 1).

With the instrument tightly clamped as shown in Fig. 4, one end of the micrometer is held against the scribed line on the crown of each bearing, using the positioning jig as shown, and the barrel of the micrometer is run out until the end of the micrometer just touches the crosshairs in the field of the telescope. A succession of readings are taken at either edge of the crowns of all of the main bearings. Any variations in the base micrometer readings, then, are an exact measure of the vertical misalignment of the bearing crowns. There the edge of one side of the bearing differs from the micrometer reading of the other edge of the bearing, an exact measure is had of the amount of cock there is in that particular bore.

An engineer's level may be used to develop the horizontal alignment of the main bearings using the micrometers set vertically as shown in Fig. 5. The micrometer barrel is extended upwards until it just touches the horizontal crosshair in the field of the telescope on the engi-

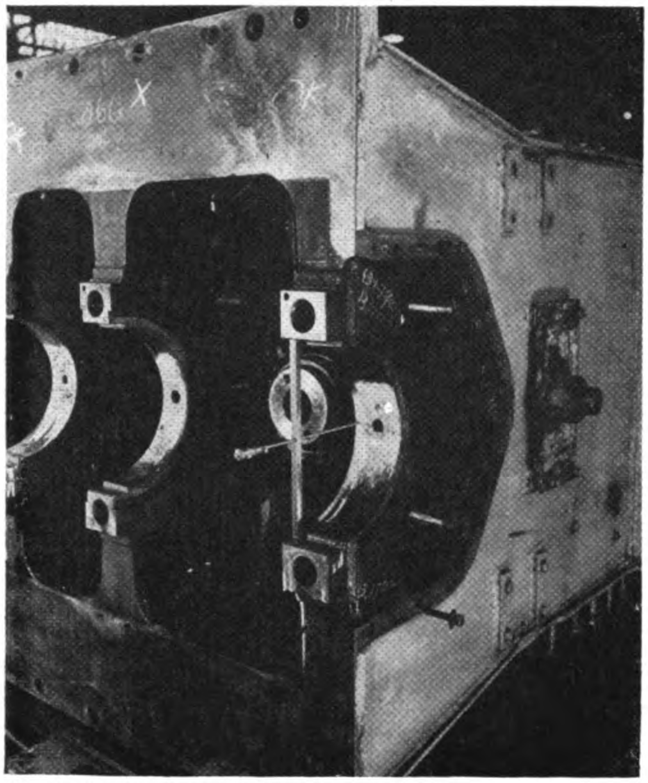


Fig. 2—Jig for holding the micrometer while taking the necessary readings with the transit

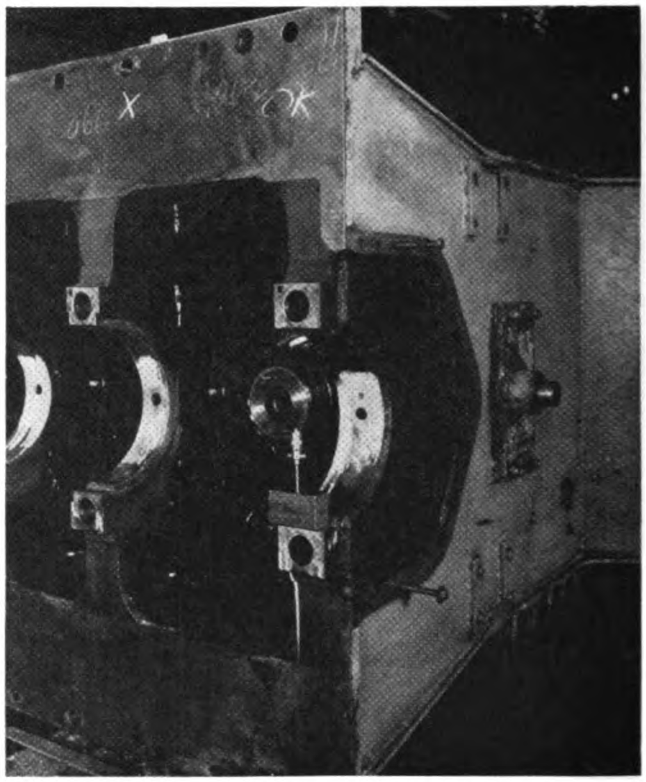


Fig. 3—Jig to hold the mike while taking measurements horizontal to the plane of the engine

neer's level. Since little instrument adjustment is needed here, the set-up is quite simple and the micrometer readings directly give the answer without any centering needed by the instrument.

Calculating the Corrections

The drawing office is called into the picture as soon as all shop readings have been made and a layout is prepared on a drawing board of the data. A magnified scale for the drawings is used such that one thousandths of an inch difference in a shop instrument reading is platted equal to one-tenth of an inch on the drawing board.

The drawing board layout is started by simply drawing a straight line anywhere on the paper. This line is the line of sight of the transit and is so marked in the sketch. From this line is laid off to scale the actual readings of the micrometer used in the shop. The twin dashes indicate the front and back edge of the crown of each main bearing. The lower set of dashes are, of course, the front and back edges of the main bearing caps and are platted from the crowns by using the inside mike readings for each bore.

The bore of main bearing No. 1 is now divided by two and its center is platted on the layout to scale and exactly in the center of the upper and lower set of dashes —note the equal signs. The bore of main bearing No. 7 is exactly located on the drawing in the same manner. The centers of main bearings No. 1 and No. 7 are in turn connected by a straight line and this line is called the true crankshaft centerline. The sketch is marked to show its location. The exact centers of the two end main bearings are used to locate the true crankshaft centerline. This is done because of the location of auxiliary drive gears at the ends of the engine. In case of damage to either one or both of the end bores, any other two main bearing bores can be used to locate the true crankshaft line. A check of the shop data taken with the transit will indicate which two main bearings would be the most reliable to use if the end bores are bent or cocked badly.

A check is now made by measuring the amount of drift between the true crankshaft centerline and the line of sight. The drift is checked by measuring the distance between each line directly under the centers of the No. 1 and No. 7 main bearings. See dimensions marked *X1* and *X2*. Any difference between these two measurements *X1* and *X2*, will be a measure of the amount the line of sight was not parallel to the true crankshaft centerline. Any large variation here will cast suspicion on the accuracy of the shop measurements. Here is the first point a good check on the accuracy of the instrument work can be made. Generally, variations between *X1* and *X2* will amount to .002 or .003 in. only and result from the thickness of the crosshair on the instrument or a small amount of parallax in the eye-piece of the instrument. Remembering that two or three thousandths of drift is spread over the entire length of the main bearings, generally some eight to twelve feet, the order of accuracy here is greater than that control used by the manufacturer in originally boring the crankshaft bearings.

The sketch at the bottom of Fig. 6 is a continuation of the one at the top. In the lower sketch the new bore to be cut into the main bearings is platted to scale about the true crankshaft centerline and the trace of this new bore is drawn through all main bearing plats. Any of the dashes representing the crowns of the bearings that lie inside of the new bore line indicate those crowns that must be cut. The amount these crown dashes are lower than the new bore in tenths of an inch indicate the exact amount in thousandths that must be removed from each crown. Any crown dash that lies above the new bore line as at No. 1 on the slide, indicates a location where the

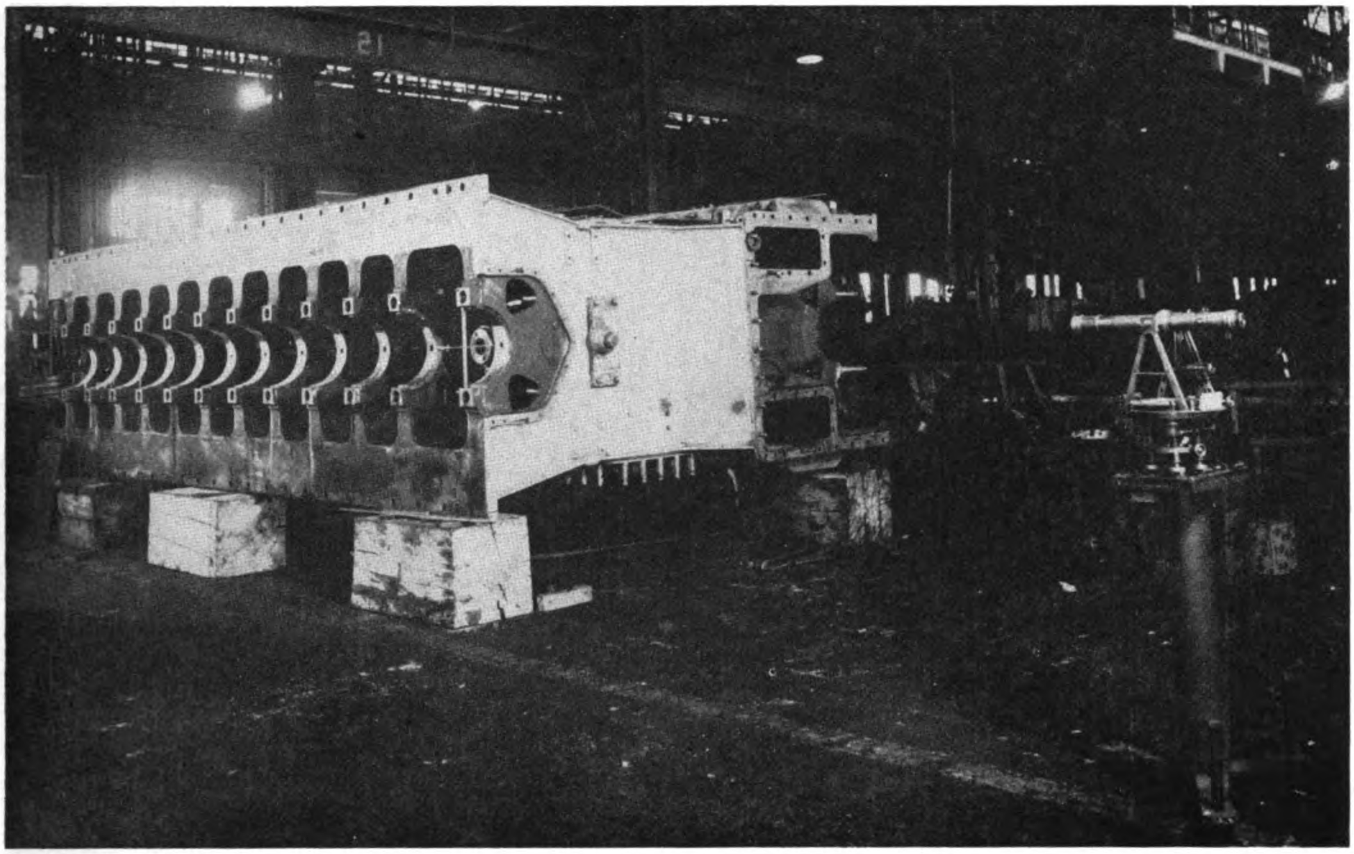
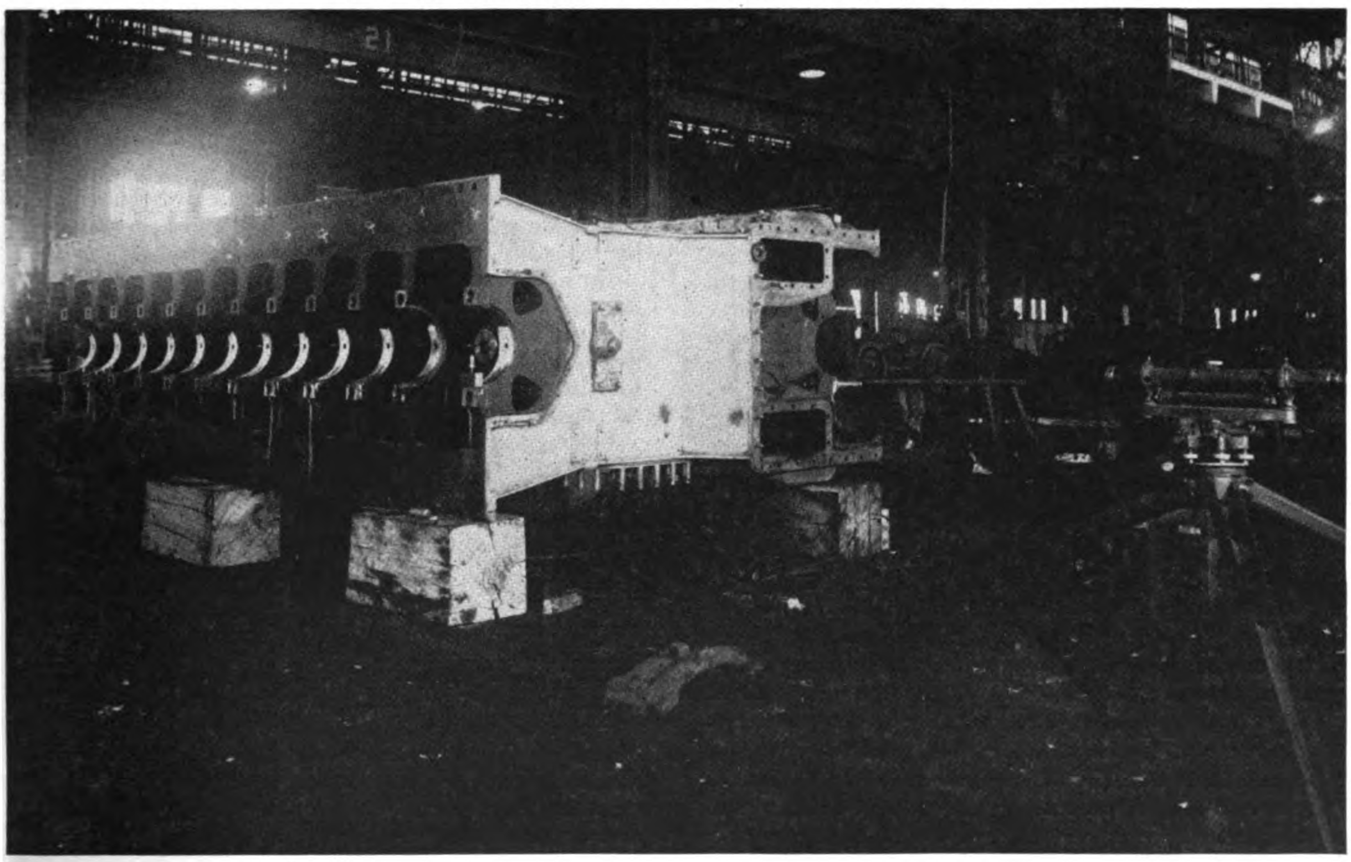


Fig. 4—The transit in position for taking readings on the crowns of the main bearings

Fig. 5—Position of the transit and micrometers for checking the horizontal alignment of the main bearings



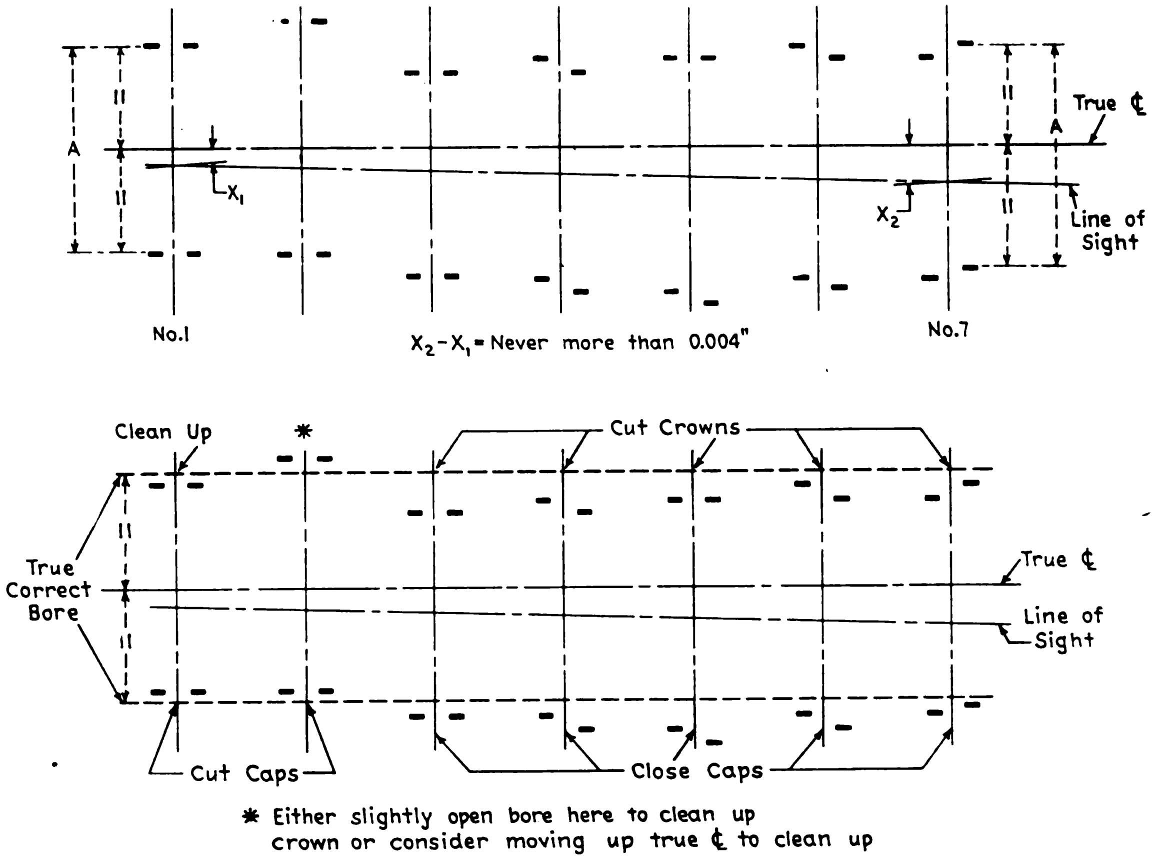


Fig. 6—The readings taken with the transit are laid out to a magnified scale. The dashes represent the front and back edges of each main-bearing crown

new bore might have to be opened slightly to clean up or, if severe enough, the amount the entire crankshaft centerline must be moved upwards to touch the high crown.

Any dashes representing the caps that lie below the new bore line indicate to scale which caps must be closed and by what amount they should be closed to clean up. Cap dashes that lie above the new bore line indicate which caps are already too high and hence, must be cut.

A written schedule can be prepared for the shop on the basis of the drawing layout that will outline the amount of cut and amount of cap closure to revise each main bearing and prepare it for boring.

A similar set of drawing board layouts can be made to study the horizontal alignment of the main bearings and a similar schedule prepared to bring all horizontal surfaces into line for boring. Small amounts of horizontal misalignment can be overcome by closing the cap at the affected main bearing an additional amount. This additional closure will amount in thousandths to just the same amount in thousandths that the bearing is horizontally misaligned.

Reboring the Bearings

A set of three bronze bushings is now prepared to fit into three of the main bores to position the boring bar. The bronze bushings are turned about .012 in. smaller than the nominal main bearing bore. This .012-in. smallness makes it necessary, of course, to shim these bushings in their respective positions to hold them tightly between the bearing cap and crown. They may be moved from side to side or up and down, depending upon just how the drawing board layout indicates the surfaces of the cap and crown of that bearing compared with the projected new bore. They are shifted according to the prepared boring schedule until their centers correspond with that wanted in the new bore. The caps are tightened about the three bearing positions and the boring bar is threaded through the bushings. (The boring bar bearings are just one and one-half thousandths loose on the boring bar.) A second check on the accuracy of the projected alignment and calculations is afforded when the boring bar threads through these three holes neatly and evenly.

Do not close the caps at the locations of the boring-bar bearings. At the start these bores must be protected because they have been defined by the transit and hence the location of their surfaces are known. The shimming for the three bar bearings will depend on the transit measurements.

Closing all caps to a point where the layout shows that a .005-in. cut can be carried in the bore will prove most satisfactory. The additional .005 in. will give enough additional stock to overcome local out-of-round and score marks in the main that is to be bored.

The boring tools can now be run through all of the main bearing bores except, of course, the three original bearings. After boring all intermediate bearings, one bronze bushing at a time is moved to an adjacent location, shimmed evenily all around now, and then the boring tool is run through the former location of the bearing.

Depth of cut of metal on all bores may be checked against the original transit measurements to see if the amount of metal being removed checks with the forecast thickness to be taken out. Checking the depths of cut when boring the first main bearing and the ease with

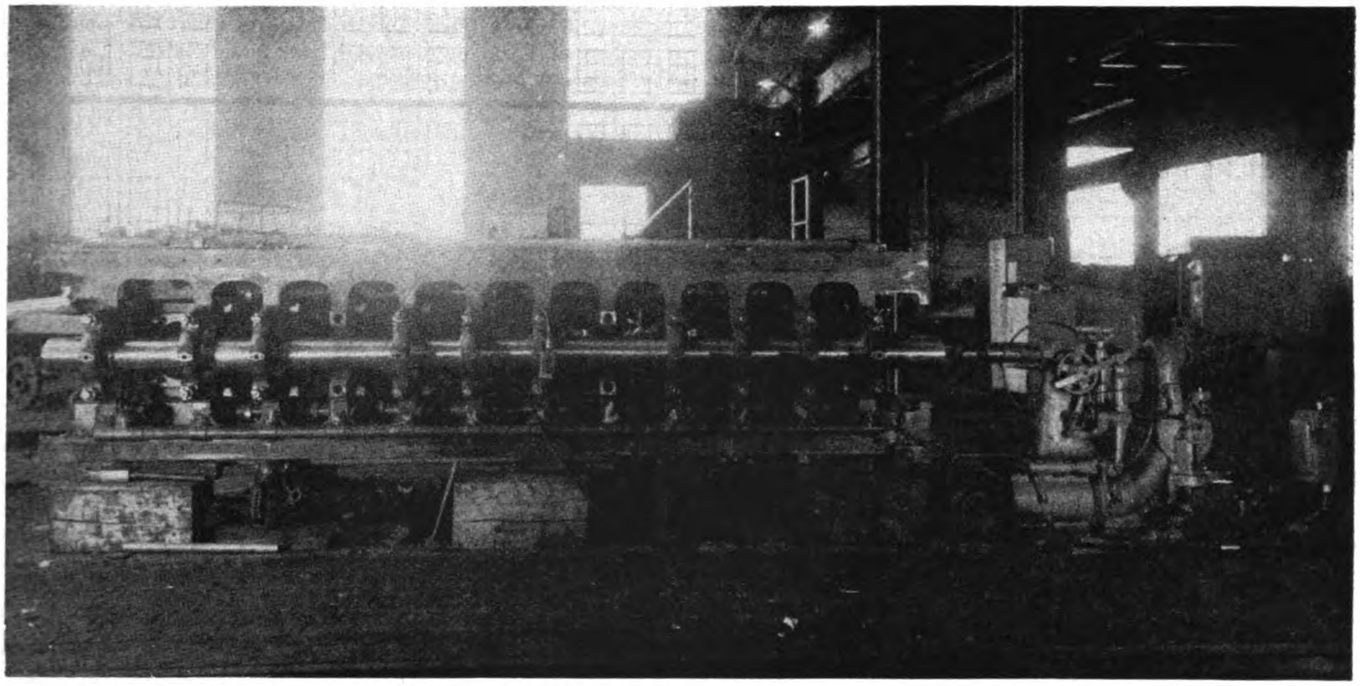


Fig. 7—Layout for reboring the engine

which the boring bar may be threaded through the three bronze bushings when first set up are important sign posts along the road indicating whether or not your original transit measurements are correct.

After completion of all borings it is advisable to set up the transit again and prove that all crowns are now the same distance from the line of sight. On a number of rebored engines the crown surface alignment has checked throughout the engine to less than .001 in. variation between surfaces.

With this method of reboring main bearings, a line bore can be put through a set of 12 main bearings over 12 ft. long and not deviate to one side or the other or up or down more than .002 in.

Steps between consecutive crowns vary .001 in. or less. Center alignments of one main bearing bore with another do not vary in location by more than .001 in. Bearing tip or out-of-plane of the crowns is eliminated in all cases.

By referring the transit alignment figures to each of the end main bearing crowns the auxiliary gear-train alignment with the main crankshaft drice gear is improved. Since out crankshaft now lies straight and true in its rebored mains, there will be no cocking of the main crankshaft end gear and the auxiliary end gears.

It sometimes happens that certain crowns in the main-bearing alignment make it necessary to move the centerline of the rebored main either up or down to clean up the lowest or highest crowns without opening the bore. When this occurs, it is advisable to limit the raising or the lowering of the new crankshaft bore to a maximum of .005 in. A movement either up or down of the crankshaft bore of .005 in. will not increase or decrease the lash between the main crankshaft gear and the auxiliary end gear by more than three-thousands of an inch. If the transit measurements should indicate a movement of the centerline of the rebored crankshaft of more than .005 in. either up or down, another check or layout must be made to study the maximum and minimum gear lash on the auxiliary end gears.

Operating Results

Service results to date have vindicated the transit method of aligning the main crankshaft bores. The past so-called normal life of main bearings on a number of 2,000-hp. engines has been doubled and perhaps tripled. We have four test engines in service, three 2,000-hp. road passenger and one 1,500-hp. road switcher. The first of the passenger engines is 10 months old, the second, six months old and the third, about one month old. None of these machines with the exception of the six-months-old engine has used a single main bearing shell since being rebored, notwithstanding the fact that a very close main bearing inspection is being carried on these units. The six-months engine got into lube-oil filter difficulties and high sediment which cut out a number of cap shells.

The road switcher has been in service about one month after being rebored. This machine came in with a broken crankshaft and a cap and crown alignment that was the poorest on record. The bed plate of the engine had to be built up with weld to provide material in certain locations for boring. We, nevertheless, laid out this machine, rebored it, reset its caps and aligned its A-frame with the bed plate by transit. When we reset the A-frame on the bed plate, we did so using the rebored crankshaft centerline as a base line and used the vertical motion of the transit telescope to line up the cylinder bores with the crankshaft. This 1,500-hp. engine represents our most ambitious project to date and has given us a great deal of satisfaction after over one month of service without trouble of any kind.

The second most extensive repair job was done on one of the three passenger engines. It had one thrust bearing badly bent, and heat had warped a number of the upper crankshaft bores so greatly that the upper crankshaft was dropped .0055 in. to get the boring tool into sound metal. The transit was the sole method of shop control in machining the lower thrust bearing after building up and in dropping our upper crankshaft centerline.

Nickel Plate Calumet Terminal

(*Continued from page 42*)

which is electrically operated, on a overhead runway in front of the boilers.

All steam condensate, except what is lost in locomotive blower lines in the enginehouse, is returned to the feed-water heater. Any additional make-up water that is required is taken from a sump in the boiler house which collects the discharge from the compressed-air cooling units. Water from the latter source is ample to take care of the normal requirements for make-up purposes. The water from the sump is pumped through the feed-water heater line only when an upper float-controlled valve on the feed-water heater is open, and a supply of water is in the sump. This is done by electrical switches run in a series to control the sump-pump motor. Should there be a lack of supply or a failure of the pump, a second feed-water float-control valve, set slightly lower than the first, will take water from the general water supply line. The boiler make-up water is treated by an injection system after it leaves the feed-water heater. The feed-water pumping and piping are arranged in duplex.

The ash-handling system, having a capacity of eight tons an hour, is of the steam-jet type, with an exhaust air washer, or dust eliminator, and an automatic timing control. The ashes are conveyed from the boilers through a hopper and underground piping to an elevated 25-ton capacity ash-storage tank. This system also removes the accumulation from the fly-ash collector.

High-pressure steam is carried more than 3,100 ft. from the boiler house in an overhead insulated conduit to a point near the coach repair shops, and in another overhead line to the enginehouse. A similarly insulated condensate return line and an uninsulated air supply line are also carried overhead on the same supports. Connections to these lines at various points run underground for serving the several terminal facilities.

The hostler's building is in a space between the steam and diesel servicing tracks. It is a one-story building, 20 ft. by 61 ft. This building contains rooms for engine supplies and ice storage, and has locker and wash facilities.

The yard office, between the entrance to the engine terminal and the train yard, is 46 ft. by 97 ft. in size, with a partial second story. The lower level contains a lobby, offices for the yardmaster's clerks and the assistant road foreman of engines; a telegraph and Teletype room with a small parts-cleaning room, a utility room, a toilet and washroom, and a large locker room for accommodating 175 men. The second story has offices for the terminal superintendent, the general yardmaster, the claim agent, and clerical staff, and rooms for stationery and file storage and toilets.

The dormitory building, a two-story structure, is for the trainmen and enginemen, residing for the most part in Fort Wayne, Ind.

On the first floor of the dormitory building is a large kitchen and restaurant, manager's office and living quarters, sleeping rooms for the commissary employees, and a television-equipped solarium-type lounge and reading room. The basement contains a laundry, two rest rooms for use of train crews, a utility room, a conference room, and a food storeroom. All floors have modern toilet and shower facilities.

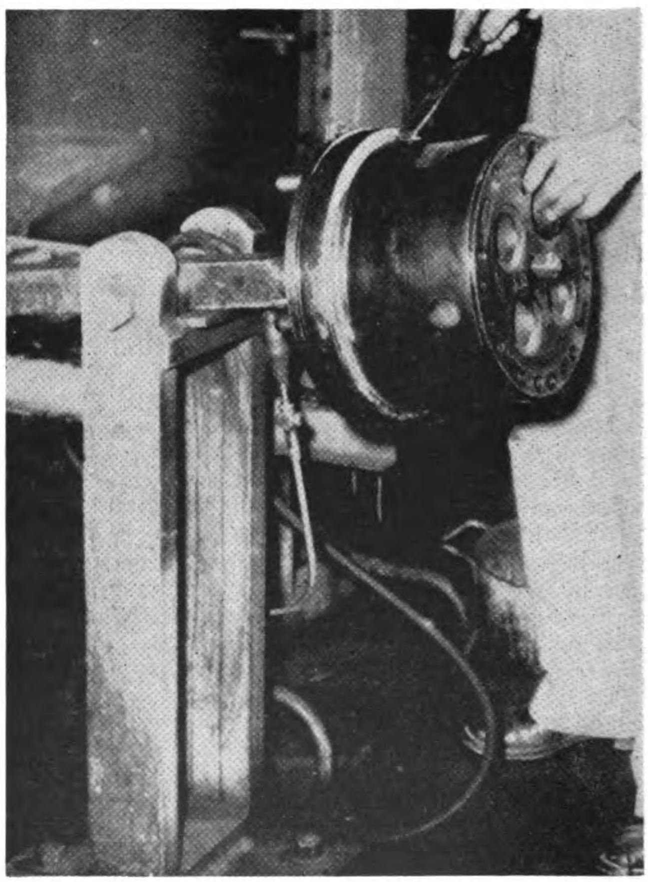
A pneumatic-tube system was installed between the new and old yard offices and between the new yard office and the enginehouse foreman's office. A two-way radio set, formerly installed in the old yard office to enable the yardmaster to communicate with all switching crews, was moved into his new office.

Stand To Clean Diesel Engine Heads

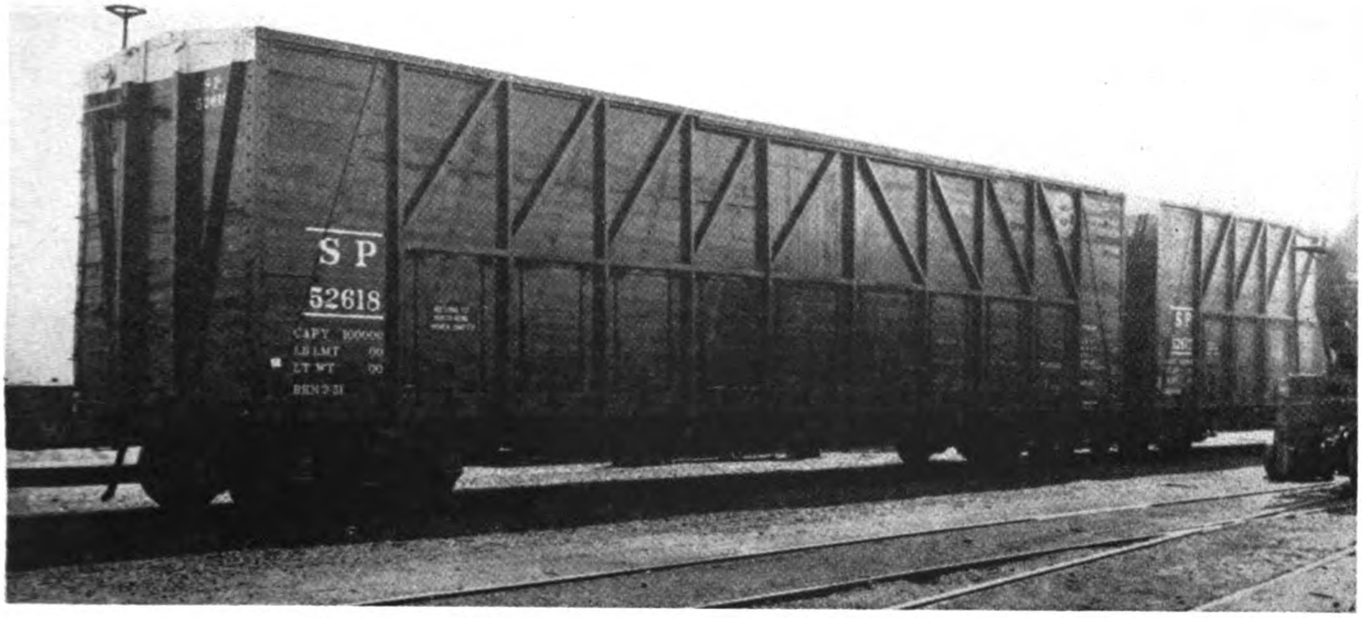
Diesel-engine heads may be cleaned by using a stand with a tilting support for the head which is vertical when there is no head on the stand but tilts to a horizontal position when the head is mounted in place.

The stand has a shaft formed in the top which fits through the injector hole in the head to hold it in place. Scarring is prevented on the injector hole by a brass sleeve which fits over the standard shaft and inside the injector hole.

The base of the stand is 1¼ in. by 10 in. by 16 in. The vertical supports are welded to this base and are 1½ in. by 4 in. by 32 in. They are 9 in. apart on the outside edges. The shaft is 2¼ in. square where the head slips on. The total length is 47 in., 28 in. from the stand to the fulcrum and 19 in. from the fulcrum to the bottom of the shaft. The stand pivots about a 1-in. bolt on brass bushings tightly fitted to keep the shaft straight. Strap iron ⅜ in. by 1¼ in. extends between the vertical supports to limit the tilting of the stand to the horizontal position.



Cleaning a cylinder head is easy when mounted on this tilting stand



S. P. box cars with 18 side doors and otherwise equipped for handling wood chips

Southern Pacific Outfits Wood Chip Cars

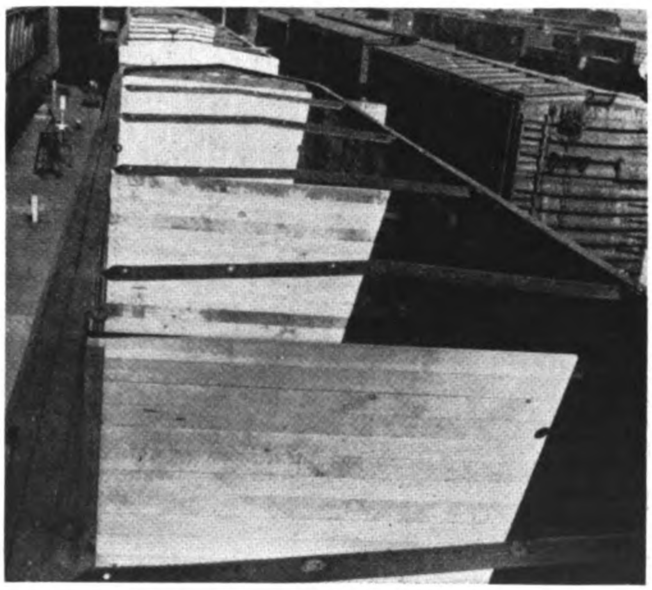
ONE of the interesting and voluminous new freight traffic movements, developed so far primarily in the Northwest, is the shipment of "hogged" fuel and wood chips from saw mills to lumber manufacturing companies for use, among other things, in making a new type of fabricated wood panels and products. The wood chips are bulky and relatively light in weight per unit of volume, so a number of railroads have equipped special cars for the efficient handling of this type of lading.

The Southern Pacific, for example, has outfitted 98, 40-ft. and approximately 425, 50-ft. box cars for handling hogged fuel and wood chips. Eighty-nine other 50-ft. box cars are also now under conversion which will make more than 600 S.P. cars in this service.

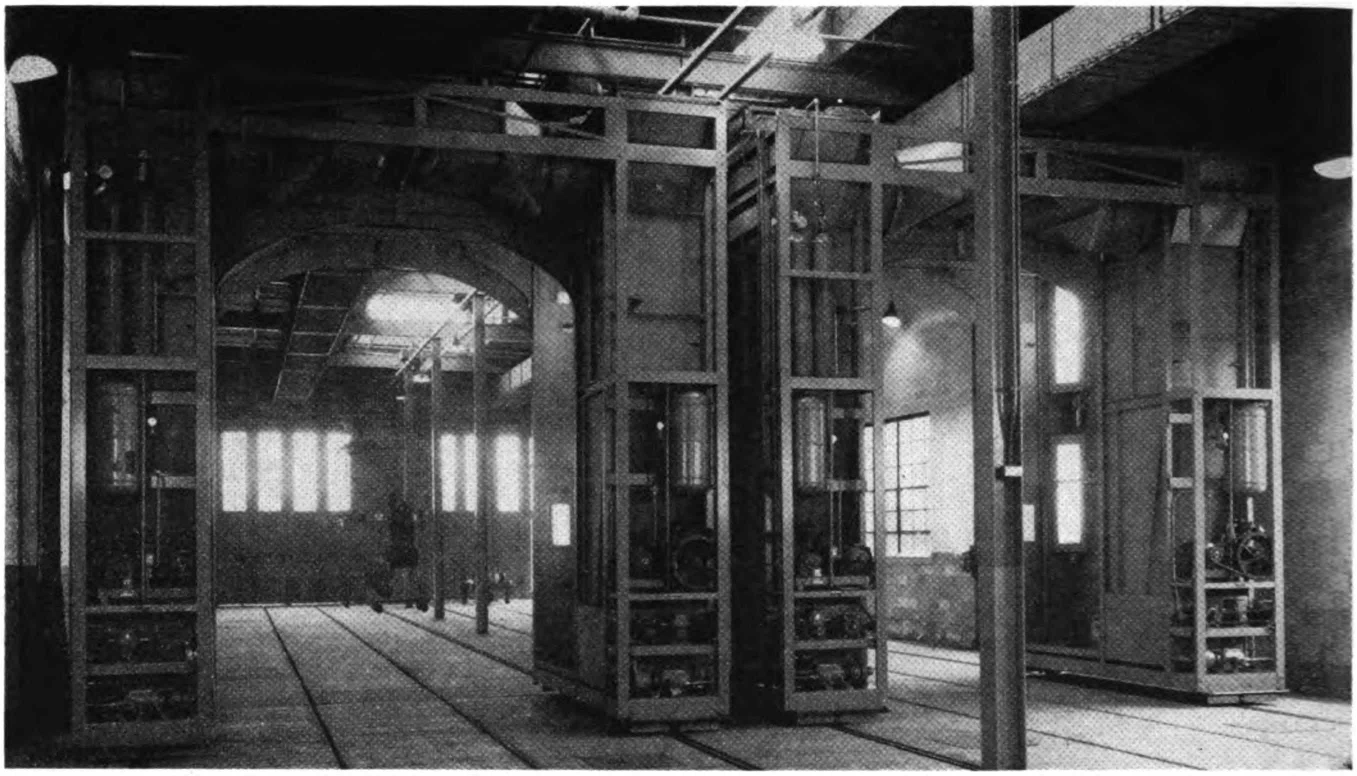
The cars selected for the service were on the borderline for retirement, the 40-ft. cars being built between 1913 and 1923 inclusive, and the 50-ft. cars in 1922 and 1923. All of these cars needed extensive repairs to roofs, running boards, carlines, underframes, sides and doors, but could be repaired sufficiently for use in this light-commodity service without having to renovate the entire car.

The illustrations show examples of this type of car now in service on the Southern Pacific in Oregon and northern California as far south as San Francisco bay area. All the cars have roofs and running boards removed. A white strip has been painted across the upper portion of the ends of each car, extending 12 in. down from the top of the car, to warn trainmen that these cars do not have roofs. Some of the cars do not have side doors, the existing doors being boarded up, while others have 2, 6, 8 or 18 hinged side doors per car for unloading purposes. The variation in doors has resulted from various methods of unloading, by suction, hand, or gravity. In cars having 18 side doors, slanting bulkheads have been applied at each end in addition to two intermediate bulkheads, dividing the car into three separate sections.

All of these cars were converted in Southern Pacific shops at Sacramento, Cal., or Brooklyn (near Portland) Ore.



Roof removed showing partitions dividing car into three sections



Pullman Installs Traveling Spray Booths

DeVilbiss equipment saves space, improves working conditions, simplifies installation

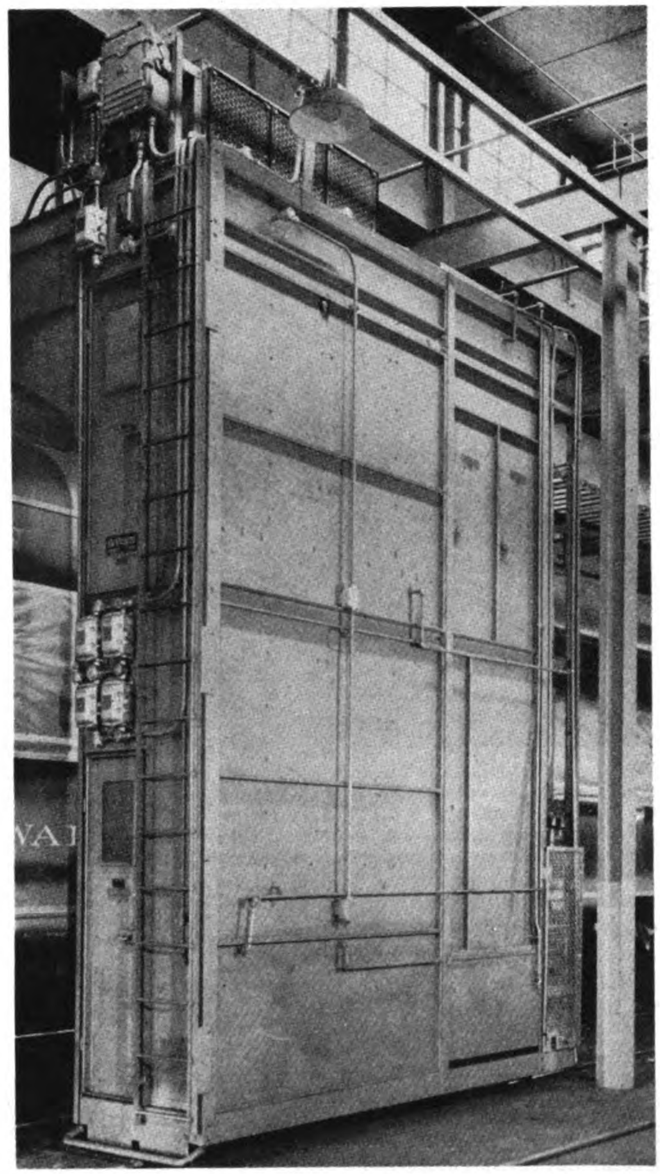
FOR finishing passenger cars at its Calumet (Chicago) and Buffalo shops, The Pullman Company has installed in each shop two units of a new type of DeVilbiss spray-painting and air-exhaust equipment—a spray booth that travels under its own power back and forth along the sides of the cars while, at the same time, filtering, washing and exhausting the spray-laden air. The painters "go for a ride" in well-lighted, "air-conditioned" surroundings while operating their paint-spray guns. The traveling-type spray booths were designed and erected by the DeVilbiss Company in collaboration with Pullman engineers.

Experience of the Pullman Company is that this type of spray booth has a number of important advantages. For one thing, it is reported that a much better paint job is obtained, with substantial savings in time, because of the ideal working conditions provided. For another, there has been a reduction in the amount of wasted paint because of the more accurate control of exhaust air movement made possible with this equipment. Also, safety conditions have been improved, for the painters no longer have to climb up or down scaffolding, or walk along it, to perform their work. Formerly, passenger cars at the Calumet and Buffalo shops were painted outdoors, when the weather permitted.

Constructed expressly to house the traveling spray booths at Calumet shop, the new paint shop, 44 ft. by 200 ft. in plan, is a concrete-block structure located adjacent to one end of the car-repair shop. In it are two standard-gage tracks running the full length of the building, each of which will hold two passenger cars. The cars are moved from the repair shop to the paint shop on a transfer table. At Buffalo the two traveling spray booths were installed in an existing building.

Booth Construction Described

The spray booths, all mechanisms of which are driven by electric motors, are each constructed somewhat in the form of an inverted U, and travel at speeds up to 25 ft. per min. on separate rails running parallel with the track rails. In plan the booths each occupy an area running 12 ft. parallel with the track and 18 ft. 4 in. transversely with the track. When a booth has been moved so that it straddles a car, the clearance between the booth and the sides and top of the car is about 6 in.



One of the spray booths in operation. One pass of the booth along a car requires about 7 min.

Each side of a booth is provided with a working space 7 ft. long, with two access doors at one end. In this space the painter stands on a power-operated scaffold which, at the touch of a button, he can move up or down to get the desired working height. In the wall behind the painter are four banks of glass-enclosed explosion-proof fluorescent lighting fixtures, two at a low level and two higher up, which are said to give better lighting than is possible in a conventional paint-spray booth.

Each side of a booth is also provided with an air-wash exhaust system, a water pump, an exhaust fan, a paint tank, an air regulator, a spray gun and hose, an air compressor for operating the spray gun, and an explosion-proof electrical control system. Each booth has a completely automatic carbon-dioxide fire-extinguishing system.

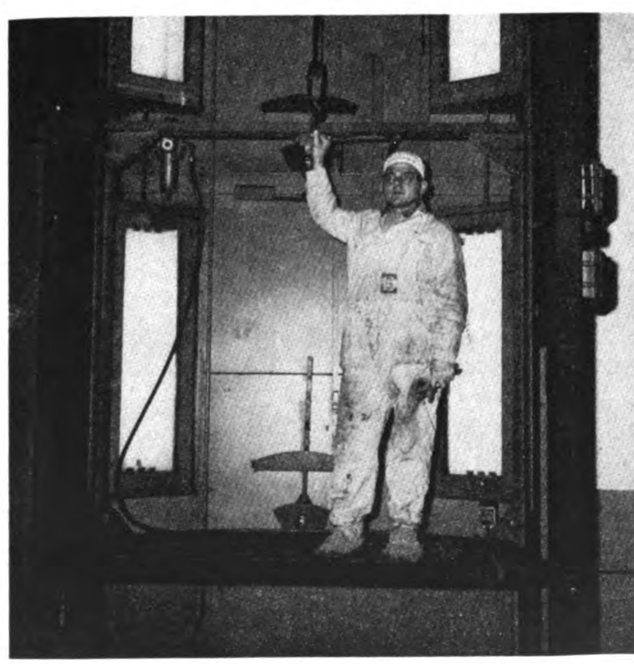
How the Booths Operate

Here is how the traveling booth performs its "air-conditioning" functions. When the exhaust fans are turned on, a suction is created throughout the air-wash chamber on each side of the booth. As a result air enters the narrow space between the booth and the car, as well as through filtered intakes, and flows at a relatively high velocity along the periphery of the car and into the air-wash chambers, carrying with it all-over spray from the paint-spray guns. The air is cleaned of pigment in the air-wash chambers, and the cleaned air is discharged into exhaust pipes leading from the tops of these chambers. The exhaust pipes in turn discharge the cleaned air into a fixed, continuous exhaust duct suspended from the ceiling and running the full length of the building directly over the center line of the track.

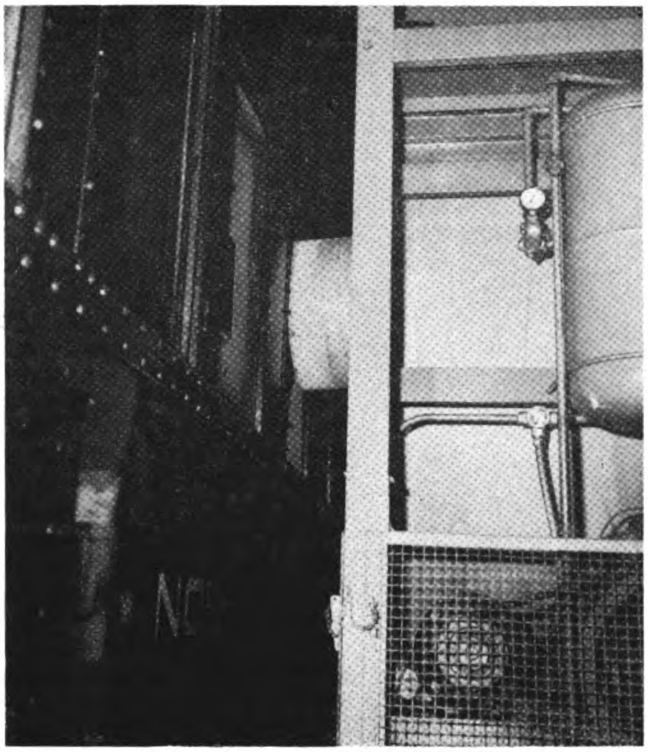
The bottom of this duct consists of a series of pivoted louvers. As the booth moves along, the louvers are opened successively by cams on the top of the booth. Only enough louvers are lifted at a time to provide an opening in the continuous exhaust duct quivalent in area to the discharge ends of the exhaust pipes leading from the air-wash chambers. Separate exhaust fans draw the air through the fixed exhaust duct and discharge it into the outside atmosphere. The exhausted air is replaced in the paint shop by a single, centrally located air-replacement unit located on the paint-shop roof.

The development of the traveling-type spray booth by the DeVilbiss Company is the result of a demand for equipment that would provide greater overall efficiency than the fixed, conventional down-draft or horizontal-flow spray booth and which would entail less maintenance and less operating cost. In other words, there was a demand for equipment that would obviate the need for providing facilities for ventilating, exhausting, heating, air-washing and lighting the entire volume of a sheet metal room 100 ft. long by 20 ft. wide by 19 ft. high while two men are spray-painting a passenger car. The objective, therefore, was the development of equipment that would permit these functions to be concentrated in the relatively small area where the actual painting is going on.

The time required to finish a car depends entirely upon the number of coats of paint, color combinations and decorative stripes required. This booth is set to travel the length of a car in approximately seven minutes. For



In the working space on each side of each unit is a power-operated scaffold which, at the touch of a button, can be raised or lowered to the proper height. Shadowless lighting is provided by four banks of explosion-proof fluorescent light fixtures behind the painter



When spray painting car interiors, an exhaust extension is placed between an air-wash chamber of one of the traveling booths and a car window. Suction of the exhaust extension causes air to flow through the car interior and keep spray-gun spatter from the painters' faces

instance, in painting a car one color, giving the roof two coats and the body one, it is necessary for the booth to travel the length of the car five times—once for the application of each roof coat, two for painting the sides, vestibules and end sheets, and once for painting the steps, boxes, water-tank casings and battery boxes—a total of 35 min. in actual movement of the booth.

The traveling booths are also used to exhaust air while passenger-car interiors are being spray painted. This is done by spotting a booth at about the center of a car and extending an auxiliary exhaust pipe from a water-wash chamber into a car window. The suction of this pipe when the exhaust fans are turned on causes air to flow from opened end doors, through car interior to exhaust extension pipe and thence into the water-wash chamber.

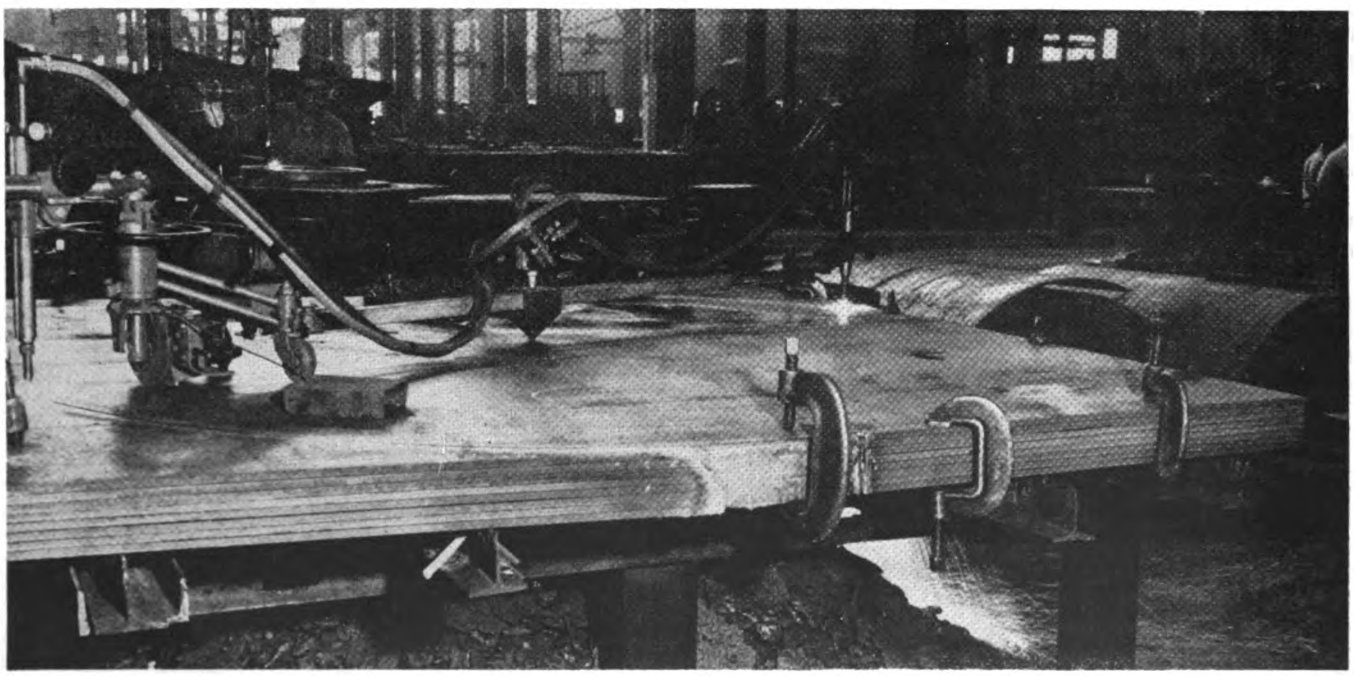
The Pullman Company has found that the traveling booth has a number of advantages over the conventional type. One of the most important of these is the fact that, in paint shops similar to the Pullman Company's, the traveling-type booth requires only about a third as much replacement air as would a conventional fixed booth. This results in a substantial fuel saving in the winter.

Another advantage claimed by the manufacturer and the Pullman Company for the traveling booth is that it saves floor space. Each occupies an area of only about 228 sq. ft. as compared with 1,900 ft. for an equivalent fixed booth. This results in more room and light in the shop and more effective supervision of the painting operation.

Moreover, the traveling-type booth is found to provide much greater flexibility in painting operations than the fixed booth, requires fewer lights, and eliminates the need for intricate sewer connections, drains and water lines, and expensive permanent scaffolding.

According to the Pullman Company use of the traveling type of booth operating on rails placed in the floor resulted in economies in the installation, as the building superstructure was not affected in any way. Further economies are being effected, it is said, in the operation of the new booths, through the savings in electricity and heat, in a reduction in the replacement of material and air hose, and in savings in the cost of cleaning and masking the booth surfaces.

* * *



A flame-cutting machine setup that makes it possible to cut as many as eight 12-ft. diameter tank head blanks at the same time. The time required to cut the blanks for dished heads from stacks of eight ¾-in. thick steel plates has been halved by using two cutting blowpipes at opposite ends of the boom. The actual speed of both blowpipes is 5 in. per min. An Oxweld CM-16 portable cutting machine has been equipped with a heavy arm and pivot point. The hose block in the center is mounted on a swivel to prevent the hose from being twisted. This installation was made at General-American Transportation Corporation, Sharon, Pa.

QUESTIONS AND ANSWERS

Diesel-Electric Locomotives*

Fuel-Oil System

339-Q.—What controls the pressure of the fuel supply as it is discharged from the pump? A.—A regulating valve maintains the pressure at 35 to 40 p.s.i..

340-Q.—What protects the system from overload? A.—The oil passes by a pressure relief valve set for 75 p.s.i. to protect the booster pump, motor and system from overload.

341-Q.—What is known as the pressure side? A.—Between the booster pump and the pressure regulating valve.

342-Q.—Describe the flow of oil further. A.—Oil then passes through a filter into the right bank fuel header.

343-Q.—What is fed from the right bank fuel header- A.—The fuel injection pumps on the right side of the engine.

344-Q.—From the right fuel header, where does the oil flow? A.—The oil crosses over at the generator end into the left bank header which feeds the left bank fuel injection pumps.

345-Q.—What serves to control the fuel oil pressure in both headers? A.—The pressure regulating valve, located at the end of the left bank header, controls the fuel oil pressure in both headers.

346-Q.—What instrument is ahead of this valve? A.—The line connecting to the fuel oil pressure gage on the engine gage panel.

347-Q.—What becomes of the excess fuel after completing the circuit? A.—Excess fuel is returned to the fuel oil storage tank through the pressure regulating valve which is set at 25 p.s.i.

348-Q.—How does the fuel reach the engine cylinders? A.—From the fuel inlet headers through individual jumpers to the fuel injection pumps. From the fuel injection pumps to the fuel injection nozzles (located in the cylinder heads) and through the nozzles to the combustion chamber of the cylinder.

349-Q.—Where is the emergency fuel cut-out valve located? A.—Near the fuel tank in the suction line to the fuel booster pump.

350-Q.—What type of valve is it? A.—A spring loaded valve similar in construction to a globe valve.

351-Q.—What is the normal position of this valve? A.—The normal position is open in which position it is latched.

352-Q.—What is the purpose of the emergency fuel cut-out valve? A.—To furnish a means of quickly shutting off flow of fuel from the tank in case of fire.

353-Q.—What must be done to close the valve? A.—It is closed by pulling the handle of the tripping yoke, allowing the valve stem to move downward and the spring then holds the valve to its seat.

354-Q.—Can the valve be tripped open at various places on the locomotive? A.—Yes, by pulling any one of the red knobs, 5 on the A unit of the road locomotive, 4 on the B unit, and 3 on the road switcher. These knobs are located at various places on the locomotive.

355-Q.—What is preferable in case of emergency? A.—It is preferable, even in an emergency, to stop the diesel engine before tripping the valve.

356-Q.—When the valve is tripped, what indication would be shown on the engine control panel fuel pressure gage? A.—The indication should be zero pounds pressure.

357-Q.—How is the valve reset? A.—Manually by pulling up on the valve stem and resetting the crutch which holds the valve open.

* This series of questions and answers relate specifically to the Alco-G.E. Diesel electric locomotives.

Steam Locomotive Boilers

By George M. Davies

Efficiency of Seam

Q.—In computing the efficiency of a longitudinal seam, why is the efficiency generally based on the pitch of the rivets on the outside row?—F.L.E.

A.—The efficiency of the seam is not generally based on the pitch of the rivets on the outside row but on the unit section of the seam, included in one rivet pitch on the outside row. As a rule the ordinary longitudinal seam is divided into a certain number of equal rivet pitches, for convenience in figuring only one pitch or section is considered. Therefore when the pitches are uniform throughout the length of the seam the efficiency of the seam will be the same as the efficiency of a unit section of the seam for a length equal to the pitch of the rivets on the outside row.

Why Grind Welds?

Q.—What is the purpose of grinding the welds of the longitudinal and circumferential seams of an all-welded boiler?—E.R.K.

A.—The purpose of grinding the welds of the longitudinal and circumferential seams of an all-welded boiler is to remove any external imperfections and to obtain a smooth surface to facilitate the x-raying of the weld.

Internal defects, determined with the use of the x-ray, can more readily be detected on a smooth weld properly ground than on a weld that is not ground.

Tubes Cracked Through Welds

Q.—We have recently increased the diameter of the boiler flues from 3½ in. to 4 in. diameter. Is it possible that such a change could result in the fire cracking of

the tube longitudinally through the welds at the tube sheet?—D.E.D.

A.—The question does not give any indication as to just how the change from 3½ in. to 4 in. diameter flues was accomplished. The change no doubt resulted in the application of nqw tube sheets with the flue spacing increased to compensate for the larger diameter tubes.

A change in the tube spacing resulting in the crowding of the flues to the extent the water space between the tubes and flues is too close, so that small accumulation of scale on the tubes and flues will result in restricting the circulation of the water to a point where the heat from the firebox temperatures is not absorbed fast enough permitting the beads and flue ends to become overheated to the extent that the structure and ductility of the flue material is destroyed, can result in fire cracked tubes.

Date of Hydrostatic Inspection

Q.—In filing the Annual Locomotive Inspection and Repair report when the hydrostatic test on the boiler has been completed prior to the final inspection of the locomotive, should the actual date of the hydrostatic test be inserted in the report or should the report be dated back to the time of the hydrostatic test so that as a record the report will indicate the actual date of the hydrostatic test for future reference?—I.M.L.

A.—It has been ruled that the date on the Annual Locomotive Inspection and Repair report should be the date on which the inspection of the locomotive was completed and the locomotive ready for service and that this date would be accepted as the date of the hydrostatic test which was made as part of the inspection of the locomotive covered by the report.

Schedule 24 RL

Air Brakes

Hauling Locomotive B Unit Dead In Train

1219-Q.—How is a B unit prepared for being hauled dead in a train?

A1.—Change dead engine cock (or change dead engine cap on the D-24 control valve); 2—Open brake pipe branch pipe cock to charge the D-24 control valve reservoirs; 3—Remove the S.A.-2 Hostler's brake valve handle in release position or secure it in that position; 4—Open the cut-out cock in the independent application and reease pipe under the hostler's brake valve; 5—Position controlled emergency cock in passenger ("P") position if used; 6—Close the cut-out cock to the N.S.-1 reducing valve.

1220-Q.—What precaution must be taken on the B unit to insure a release of the automatic brake?

A.—The B unit must have an atmospheric opening from the actuating pipe *13* and the independent application and release pipe *20* to insure a release of the automatic brake.

1221-Q.—What is the most positive method to insure this opening?

A.—The most positive method is to remove the air hose or pipe plugs from the dual connections.

1222-Q.—In this connection, what other pipe must be considered?

A.—The straight air pipe when used, must also be considered.

1223-Q.—How are the locomotive brakes then controlled?

A.—From the automatic brake valve on the lead locomotive.

Multiple Unit Operation

1224-Q.—How are the brakes controlled when two or more diesel A power units are operated together, all hose couplings coupled and end cocks open?

A.—From tbe leading unit.

1225-Q.—What must be done on all other A units?

A.—Close brake pipe cut-out cock, place K-2 rotair valve in Lap (or K 2-A in either "FRGT" or "PASS" Lap) and remove the brake valve handles.

1226-Q.—What must be done if the actuating and independent application lines (13 and 20), are not connected between the units?

A.—Rotair valve must be in "FRGT" or "PASS" position.

Double-Heading behind Steam Locomotive

1227-Q.—When preparing double-heading on a Diesel power unit behind a steam locomotive, what must be done first?

A.—Move the shifter lever (if included) of the brake valve to automatic (A.U.) position.

1228-Q.—What action should follow?

A.—Make a full service application, close brake pipe cut-out cock but leave the rotair valve in "FRGT" or "PASS" position depending on the service required.

1229-Q.—How are the brakes controlled?

A.—By the lead locomotive.

1230-Q.—Is emergency available on units other than the one in the lead?

A.—Yes. The engineman on the diesel unit can make an emergency application by moving the automatic brake valve handle to emergency position.

1231-Q.—What other control does the engineman on the diesel unit have?

A.—He can release the brakes on the diesel power unit by depressing the handle of the independent brake valve.

Brake Valve Position After Emergency Appication

1232-Q.—In what position should the automatic brake valve handle be placed after an emergency application originating from any source other than the brake valve in freight service?

A.—In Lap position.

1233-Q.—What should be the handle position if this occurs in passenger service?

A.—Emergency position.

1234-Q.—Why is emergency position specified in passenger service?

A.—This is the only position in which the brake pipe supply is cut off with electro-pneumatic operation.

Operating "B" Units With S.A.-2 Hostler's Brake Valve

1235-Q.—What should be done before separating, or closing cocks?

A.—Make a full service application.

1236-Q.—What should be done with the reducing valve?

A.—When ever practical, set the N.S-1 reducing valve at or near the brake pipe pressure carried on the A unit.

1237-Q.—What then should be done?

A.—Close the brake pipe and independent application and release pipe end cocks on both ends of the unit and part the hose.

1238-Q.—What action should follow?

A.—Open the cut-out cock under the SA-2 brake valve and move the handle into the application zone.

Standby Power for Passenger Cars

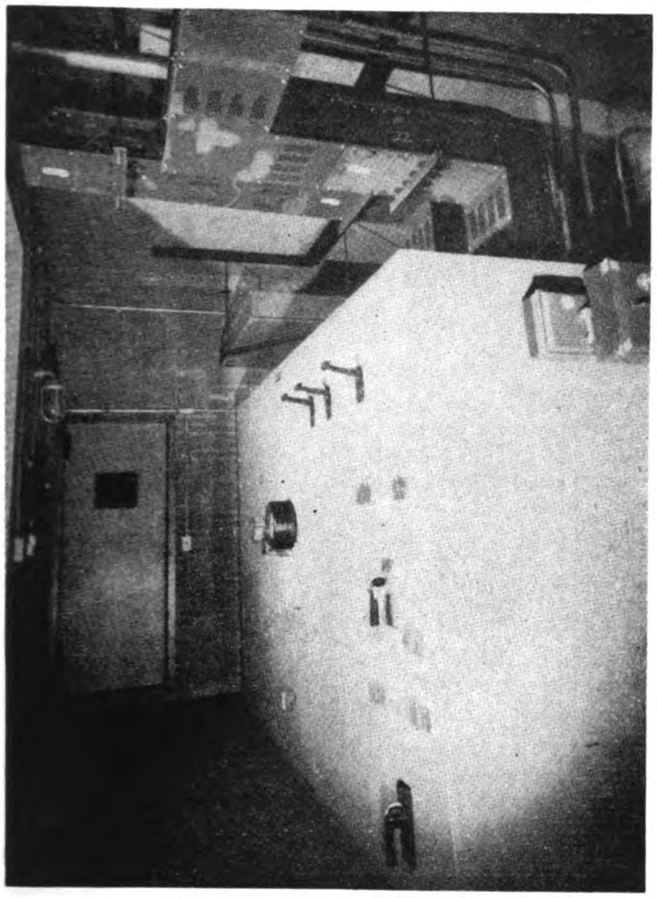


Fig. 1—Switchboard cubicle in vault under the station tracks

New Haven's installation at Boston is a fine example of electrical construction which has proved its usefulness

Fig. 2 (Left)—Heater and controls for maintaining suitable temperature conditions in the switchboard vault

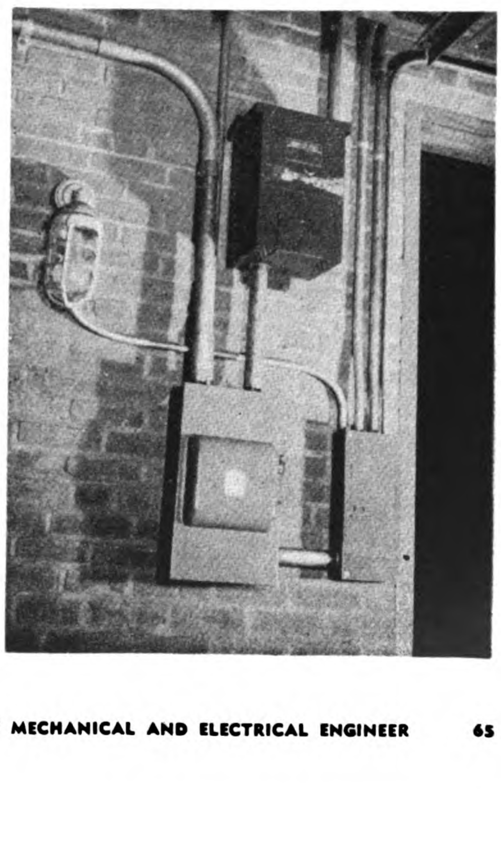


Fig. 3 (right)—Two power sources and a double-throw switch assure power for lighting in the vault

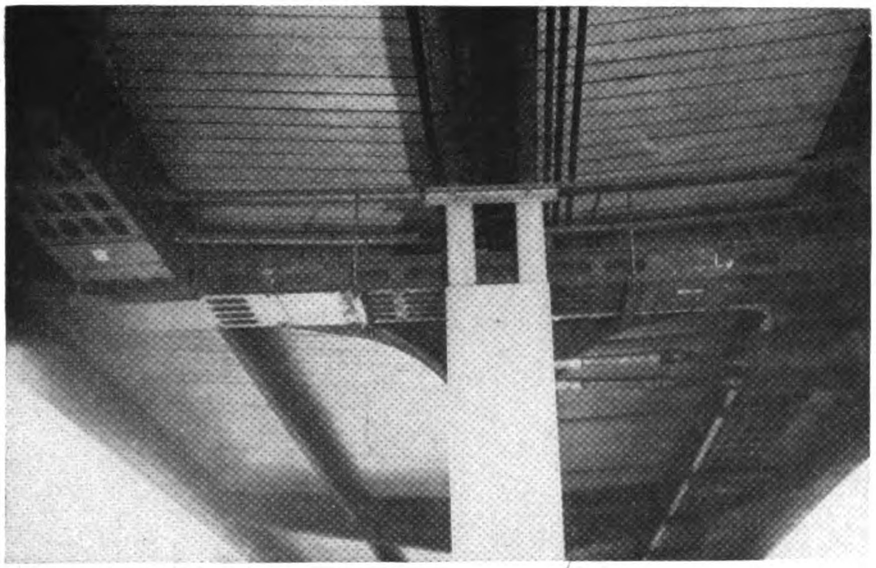


Fig. 4—Vertical ducts from the switchboard cubicle are carried inside a steel housing to the shed roof where they branch to run north and south respectively

To provide assurance that no car leaves South Station with a low battery and to pre-cool sleeping cars which are held in the station for the convenience of passengers, the New York, New Haven & Hartford installed a standby power system for three of its tracks in its Boston, Mass., terminal. The installation has now completed a year of service and has proved its ability to fulfill the purpose for which it was installed. Three-phase, 220-volt power is supplied to three of the 26 stub-end tracks in the terminal by 36 outlets spaced 80 ft. apart along these tracks, and there are also four outlets on one mail and express track at the eastern edge of the terminal.

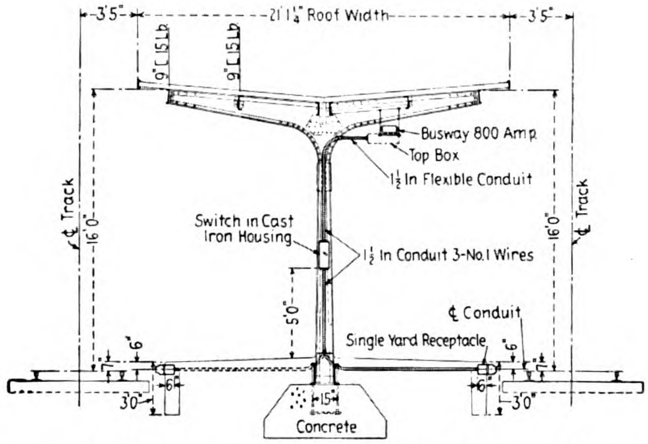
Power Supply

Power is purchased from the Boston Edison Company. It is brought in at 13,800 volts to a transformer owned by the utility, and located in a tunnel under the tracks. The transformer is in a vault behind the door shown at the rear of Fig. 1.

Power is purchased by the railroad at 220 volts, 60-cycle, 3-phase and is delivered to the railroad's dead-front switchboard, also shown in Fig. 1. The main 220-volt circuit is protected by a 3,000-amp. I.T.E. circuit breaker, and there are two 800-amp. breakers and three 400-amp. breakers for the branch circuits. The 800-amp. circuit-breakers control 800-amp. busway feeders, north and south, respectively, and run on a platform which supplies two tracks. Two of the 400-amp. breakers control 800-amp. busway feeders which run north and south respectively on a platform that supplies outlets on only one of the two tracks, and the fourth 400-amp. breaker controls the circuit which runs to the mail and express track.

To assure suitable atmospheric conditions for the equipment in the switchgear vault, there is a four-kw. Chromolux electric heater, equipped with a motor-driven fan, shown at the top of Fig. 2. If the temperature falls below 65 deg. F., a Penn Electric Switch Company thermostat at the lower end of the control circuit conduit will close the circuit to the heater. If the relative humidity exceeds 68, the Minneapolis-Honeywell humidistat shown just above the thermostat, will also start the heater.

To assure lighting in the switchgear and transformer valuts in case of a power failure, power for lighting is supplied from two sources. One of these is from the 220-volt standby circuits through the 5-kva., dry-type transformer shown at the top of Fig. 3. The other is from a separate power source. Both of these are brought into the double-throw switch, lower left, Fig. 3, from which one or the other supplies the branch-circuit panel at the right.



Section of a butterfly shed showing bus duct mounting and branch circuits

Feeder Distribution System

The 220-volt standby power is conducted from the main secondary switchboard cubicle in the vault in two 1,600-amp. Bus Ducts, each duct containing two 800-amp. buses. The ducts are run vertically to the underside of the platform cover shed where they branch two ways as shown in Fig. 4. They were supplied by the Marshall Company, Boston, Mass.

Where the 1,600-amp. Bus Ducts come through the platform, they are protected by a metal housing made of ¼-in. boiler plate with a minimum space of 2-in. between the housing and the duct. The housing is mounted on 3-in. by 3-in. angles. The duct is also supported at three points on these angles. The protection extends nearly to the roof of the butterfly shed as shown.

The means used for hanging the duct is shown in the drawing and also in Figs. 4, 5 and 6. These supports are on five-ft. centers. Branch circuits to the trackside out-

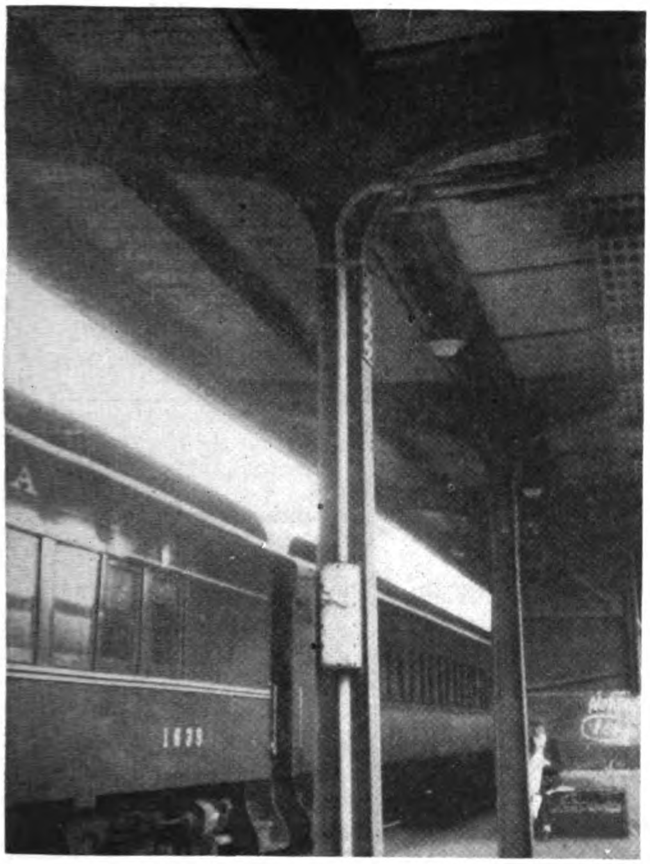


Fig. 5—General view of a platform

lets are made as shown in the drawing and in Fig. 6. These consist of three No. 1 rubber-insulated conductors in a 1½-in. conduit which is run down into the platform in the roof-supporting channel. A section of Flexspansion flexible conduit between the junction box and the rigid metal conduit allows for movement of the duct caused by thermal changes.

The branch circuits are protected by Westinghouse 100-amp., 3-pole, 250-volt De-ion breakers in Albert & J. M. Anderson cast iron enclosures placed in the channels at a convenient location for manual operation. These

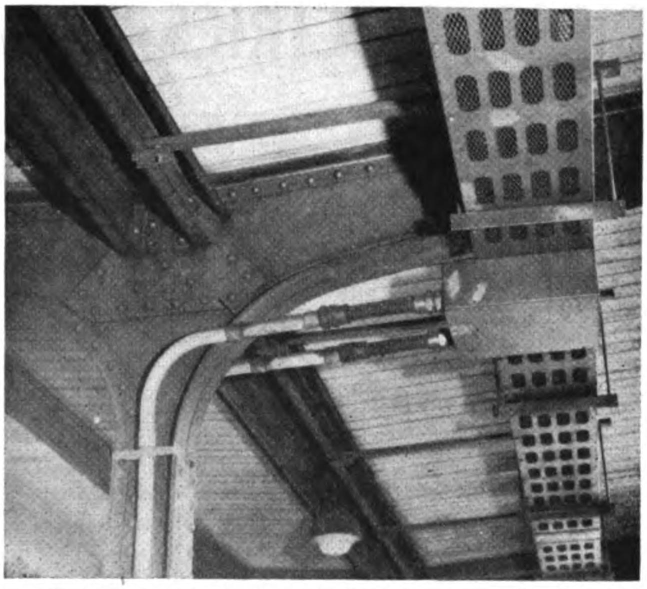


Fig. 6—A section of the duct showing a tap box and two branch circuit conduits

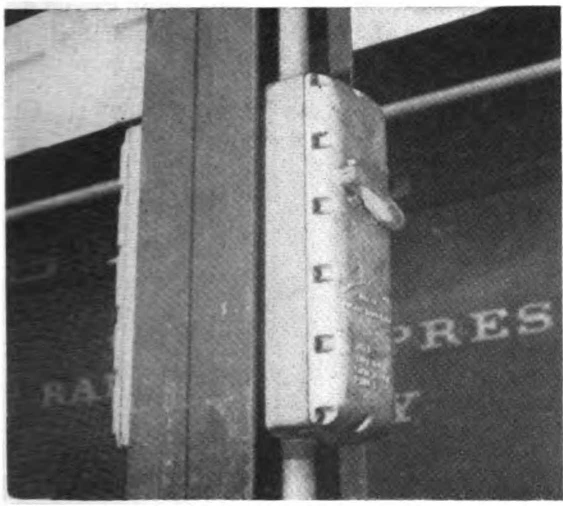
were chosen because they could be placed in the channels as shown in Fig. 7.

The branch circuit conduits are run through the concrete platform to Albert & J. M. Anderson receptacle boxes mounted on the edges of the platforms as shown in Fig. 8.

Portable cables used between the receptacles and the cars are Simplex type G neoprene-insulated cables. They contain three No. 2 power conductors and three ground wires connected together. All plugs and receptacles have four poles.

The distribution circuits described serve two tracks on opposite sides of one platform. There is a second platform equipped to serve a third track. Construction on this platform is similar to that described except that there is one instead of two branch circuits run from the Bus Duct. The capacity of the duct is sufficient to allow for serving of a fourth track should that become desirable.

The standby power system was designed and installed under the direction of F. A. Rogers, Engineer, Electric Lighting and Distribution, New York, New Haven & Hartford.



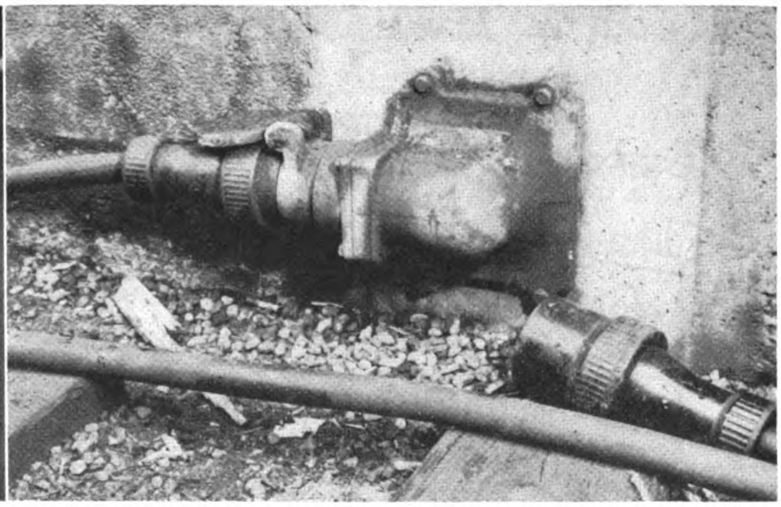


Fig. 7 (left)—Enclosures for two circuit breakers mounted in the column channels. Fig. 8 (right)—One of the outlets and a cable showing identical plugs on each end

DIESEL-ELECTRICS—How to Keep 'Em Rolling

5 Brushes and Brush Rigging*

Don't be deceived by the simplicity of a brush. It can cause serious trouble in fourteen different ways if it is not properly cared for

Brushes are simple looking things—just a block of carbon—but this simple appearance doesn't tell the whole story. Actually they do a mighty big job in passing large quantities of current through their sliding contact with the whirling commutator surface which speeds past them at a hundred miles an hour. This job is all done without oil or grease for lubrication.

Carbon is an excellent material for brushes. It handles the heavy currents without fusing or welding to the commutator when sparking or flashovers occur. It is readily molded into the right shape and can be treated to give soft, hard, or tough brushes. When the proper grade of brush is used, a very thin, glossy film is formed on the commutator. The brushes ride on this film. The advantage of this is that wear takes place in easily-replaced brushes rather than in the costly commutator.

There's More to It

Having a good material isn't the end of the story. If the hard-working brushes are to do their stuff, the maintainer must watch several things:

1. Grade and type of brush.
2. Commutator surface condition.
3. Brush holders.

Watch Your Grade

This important item is often confusing to maintainers. It isn't always easy to choose the right grade of brush for a motor or generator on a certain locomotive. From long experience, the builder usually recommends what he knows will give good results in most operations. Be very careful about changing that grade, or you may save pennies on brushes to spend dollars on commutator repairs.

A quick look at brush grades will give an idea of the effect of different brushes on your equipment.

(a) Soft brushes are usually very easy on the commutator. They quickly produce and maintain a good surface film. Their friction on the commutator is usually low, tending to keep it cool. Such brushes are recommended wherever they can be used economically. In applications where equipment gets rough service, they break or quickly wear and a stronger brush is needed.

(b) Hard, tough brushes, unlike the "softies," can take a pretty good beating before breaking. "Great!" you might say, "Let's buy hard brushes." Wait! Not only can hard brushes take a beating—they can also give one to the commutator, by bouncing and sparking at high speed.

Naturally, the alert maintainer wants to keep brush mileage high. If wear or breakage increases, he will be tempted to use harder brushes. What he really should do is try to find the cause of the trouble. Some common ones

*This is the 5th of a series of articles on maintenance of diesel-electrical equipment. It is written by J. W. Teker and J. H. Kathman, both of the Motor Engineering Division, General Electric Company, Erie, Pa.

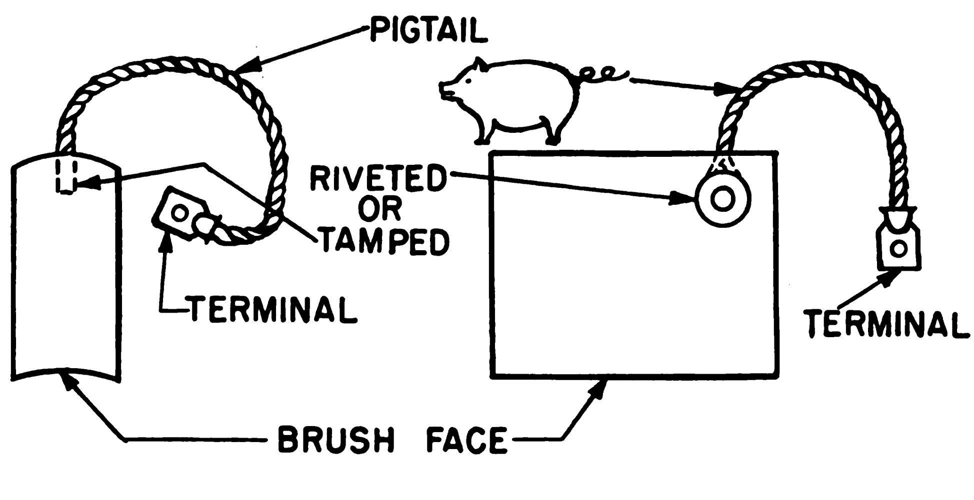


Fig. 1—Solid type brush

are wheel-slip overspeed, stalled motors, or abrasive dust in the air. Changing to very hard brushes might get him out of trouble today, but he would likely have to pay the penalty in damaged commutators later.

The best brush is usually a compromise between soft and hard grades. This gives many of the good features of both and gets away from some of the troubles just mentioned.

(c) Abrasive brushes, also known as "scrubbers," are sometimes used to keep a commutator surface clean. Unusual operating conditions may burn and dull a commutator surface beyond the point of self-recovery. The frequent stoning necessary to keep it in operation would take too much time. Here the mild, abrasive action of "scrubbers" will keep the job going. Of course, you will have higher commutator wear, so use "scrubbers" cautiously, and only as a last resort.

Besides the grade of brush, you must also think of its design. There are two main types: solid and duplex.

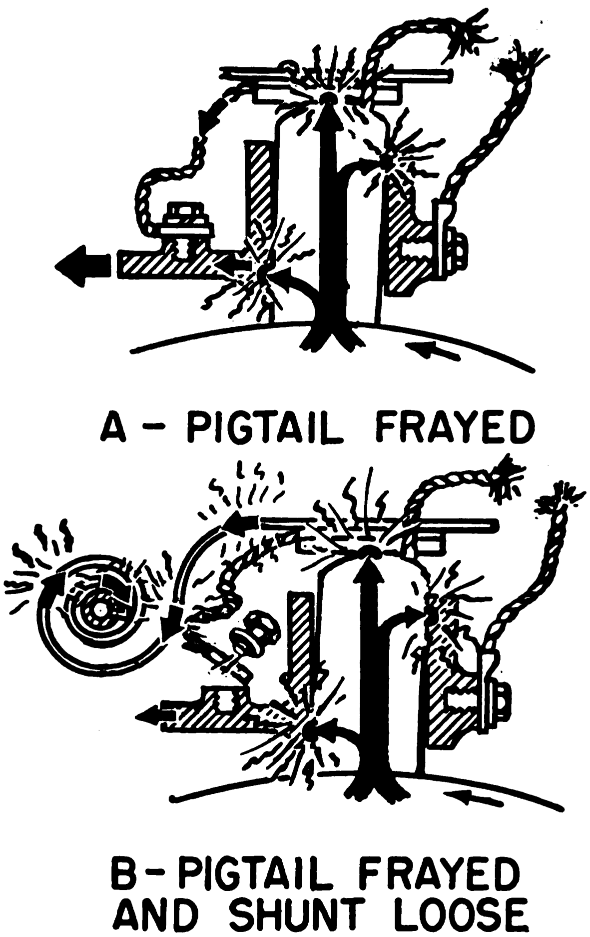


Fig. 4—Results of poor maintenance

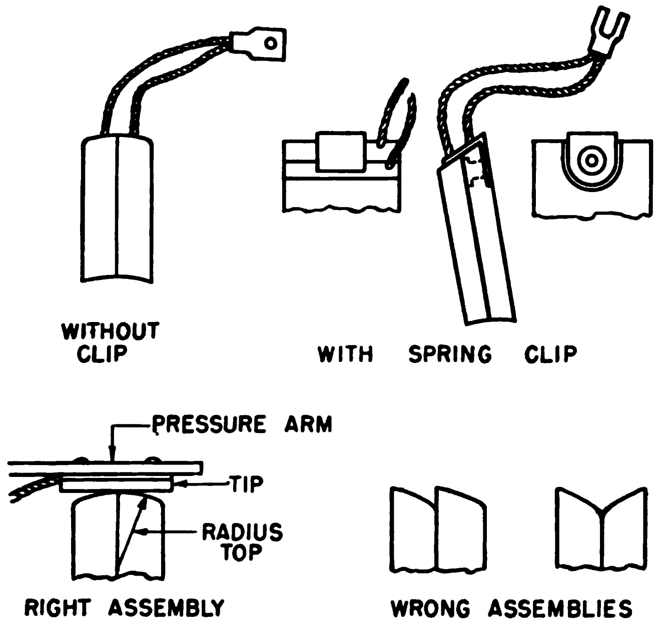


Fig. 2—Duplex type brush

The simpler solid brush, Fig. 1, is used wherever operating conditions permit. It has the advantage of low first cost and easy handling when replacing brushes.

The demand for greater power in a given size locomotive has meant increased duty on all parts, including the brushes. Greater commutator speeds, higher currents,

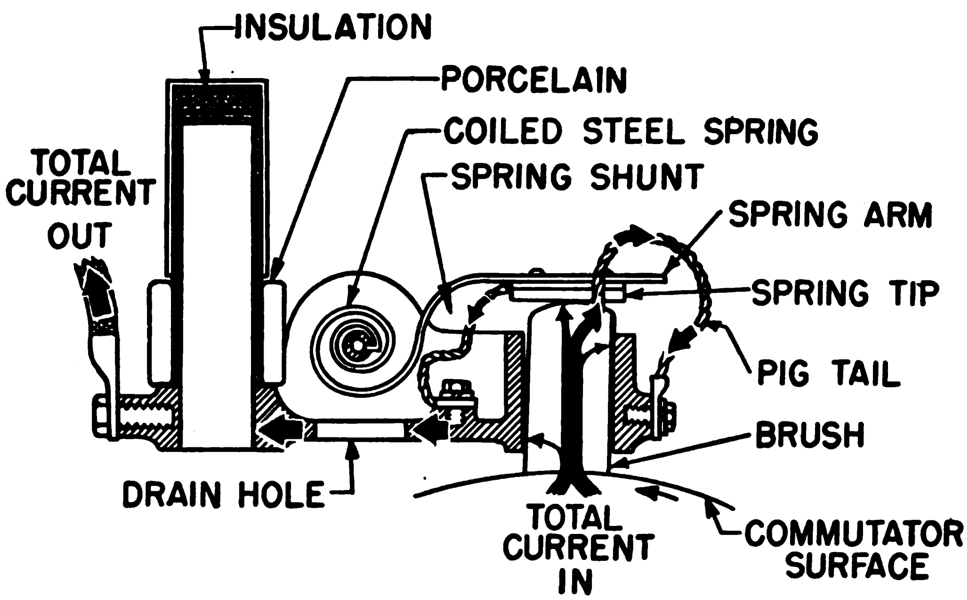


Fig. 3—Typical brush holder

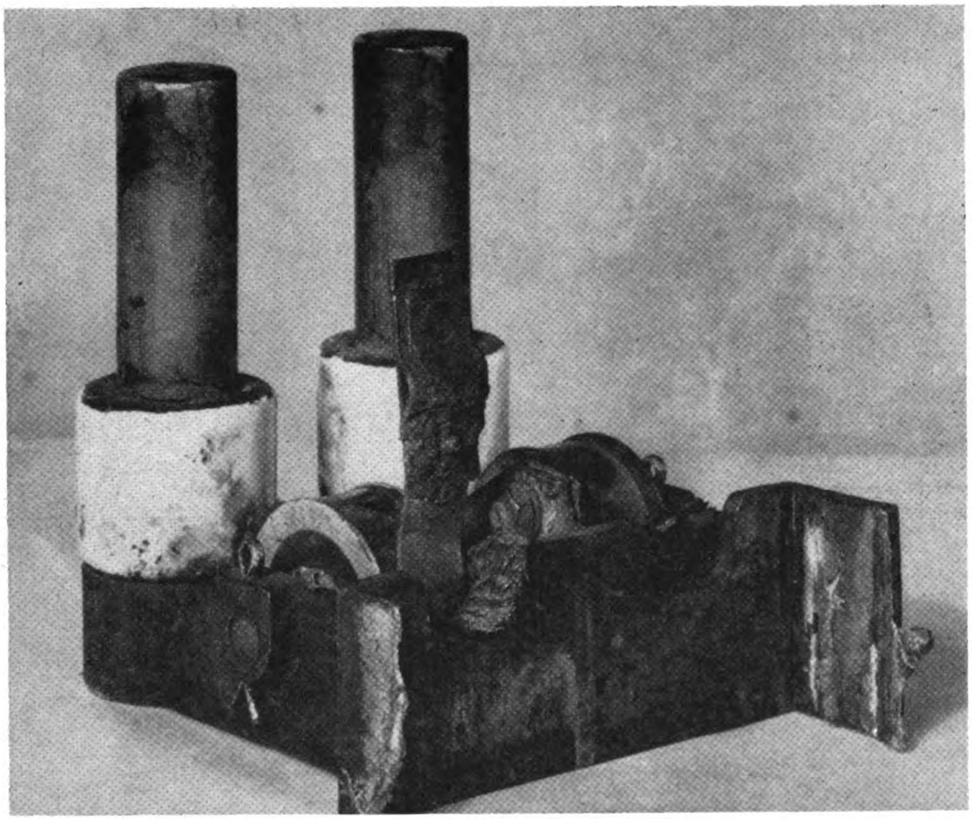


Fig. 5 — Neglect of proper maintenance of brushes and brush rigging may have serious results, as this melted traction-motor brush holder testifies

and tougher service have sometimes reached the limits of the solid brush. When this happens, commutator surfaces become poor and brush maintenance goes up. Here the duplex brush, Fig. 2, proves better.

Believe it or not, cutting a solid brush into two smaller pieces makes it do a better job of riding the commutator and handling the current. The duplex brush has a higher first cost and is a little more trouble to handle. It pays off, though, in lower over-all maintenance and greater reliability in heavy duty jobs.

Where Surface Counts

It's very important to keep the brushes on the commutator at all times. A bouncing brush hammers itself to pieces and gives the commutator and brush rigging a beating. Worse yet, it draws an arc at the commutator surface. This eats away the copper bars and makes matters even worse. Putting it the other way around—to keep good brushes operating properly—the commutator surface must be smooth.

The Rest of the Team

A good brush—like a big league pitcher—needs a team to back it up. The brush holder is this team. Its most important plays are to:

1. Get current into and out of the brush.
2. Keep the brush in the right position.
3. Keep the brush on the commutator.

Let's see how a typical traction-motor brush holder, Fig. 3, plays the game. Normally, most of the current is carried by the pigtail. A small amount may sneak out the side of the brush and get into the holder through the

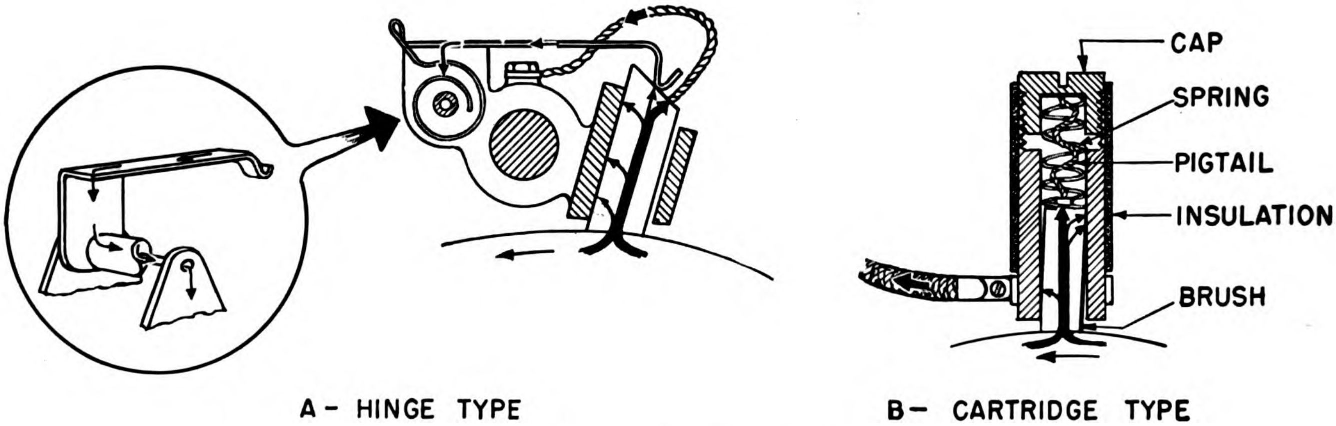


Fig. 6—Two more types of brush holders

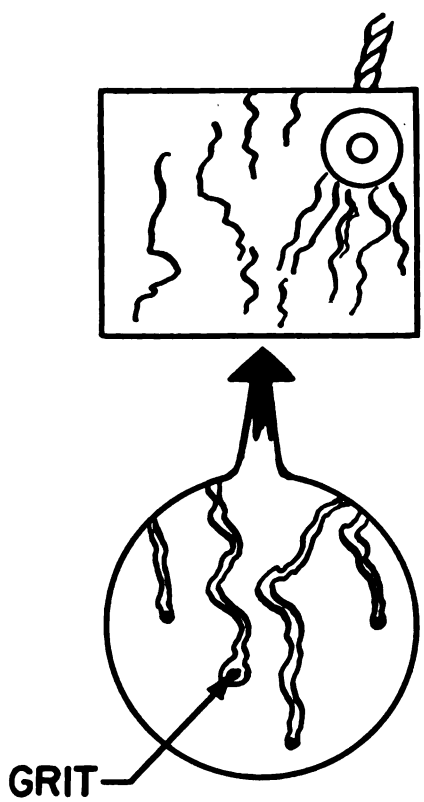


Fig. 7—Brush affected by grit

carbonway. More of it gets out of the brush top through the spring tip and shunt. But the pigtail carries the big load because it makes a good, solid connection between the brush and holder. In contrast, the brush makes only a moving, touching kind of contact with the spring tip and carbonway.

Sometimes the pigtail gets loose in the brush or may not be tightly fastened to the brush holder. Also, it may become badly frayed or broken. When any of these things happen, most of the current is forced to go through the carbonway and the spring tip and shunt. The moving contact of the brush with the carbonway and spring tip is poor and can carry only small currents. In easy service with low starting currents, a brush holder in this shape may get by without much maintenance trouble. But in hard service with heavy train starts, these poor contacts can get glowing hot, see Fig. 4. Giving a brush holder the "hot foot" like this is no good. Wear increases and repairs begin to pile up. Remember—a good pigtail connection is a mighty important link in proper maintenance.

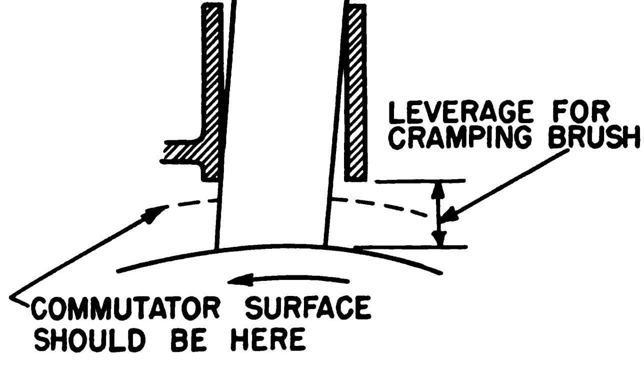


Fig. 8—How brush holder position affects cramping

The next most important current carrier is the spring shunt. If anything goes wrong with the pigtail, this acts as a backstop and carries most of the current, as in Fig. 4A. If the shunt stops carrying current, you are in for real trouble. This can happen by the shunt loosening where it connects to the brush holder, or by its getting frayed and broken. Then current will be forced to flow through the spring itself, Fig. 4B. Since the steel in the spring has a much higher resistance than the copper shunt, the heavy current flow makes it so hot that it loses its temper. With the spring out of commission, the brush can bounce on the commutator as much as it likes. This overloads the other brushes until they also fail. Then arcing between the brushes and commutator starts and a flashover may result. Worse yet—when trying to start a heavy train, it can melt off the brush holder, Fig. 5, and burn a hole in the commutator. Then you have a road failure.

You can usually bring a train in, even though a pigtail has failed, when the spring is protected. But if the spring isn't protected, you're in for trouble. Also, a loose pigtail waving around can do a lot of damage. If it touches the frame, it will ground the motor. If it drags on the commutator, it will cause a flashover. So you better see that pigtails and shunts are tight. Also, make sure that they are looped away from the brush spring so they won't wear and fray open.

Two other designs of brush holders are also used in railroad work, see Fig. 6. The first has the lever arm moving on a hinge pin and an independent spring. This arm offers a shorter and better path for stray current than the long, coiled clock spring. The second is the cartridge, or completely enclosed type, used for low power on small machines.

Position Is Important Too

The radial type of brush holder is used on machines, such as traction motors, that operate in both directions. It has a carbonway, or brush box, that holds the brush in a radial position on the commutator. The brush tilts slightly whenever the motion of the commutator reverses. Hence, the clearance between the brush and box must be kept as small as possible. When the box wears, the brush cramps and wedges itself. Not being free to follow the commutator surface, the brush then sparks and chips; the commutator is damaged and brush life is reduced. Electric pitting is one big cause of wear in the brush box, but abrasive dirt can also cause it to get sloppy in a hurry.

Sometimes dirt makes odd patterns on the brush, as shown in Fig. 7. This is often mistaken for electric burning, but actually it results from sand or gritty dirt between the brush and box. This dirt digs a worm-like path in the brush, and also wears down the walls of the box. Once you have closely examined such a case, you will never mistake it for electric action. Rather, you will start looking for a way to keep dirt out of the machine.

Worn brush boxes are not the only trouble caused by dirt. Sometimes oil gets between the brush and box where it mixes with dirt and forms a gum which sticks the brush in the box. The effect is the same as removing the spring pressure, and the brush gets stuck off the commutator and quits working.

One more important point. Be sure to keep the recommended distance between the brush holder and the commutator. Don't fail to check this if you are replacing a brush holder or have resurfaced the commutator. If

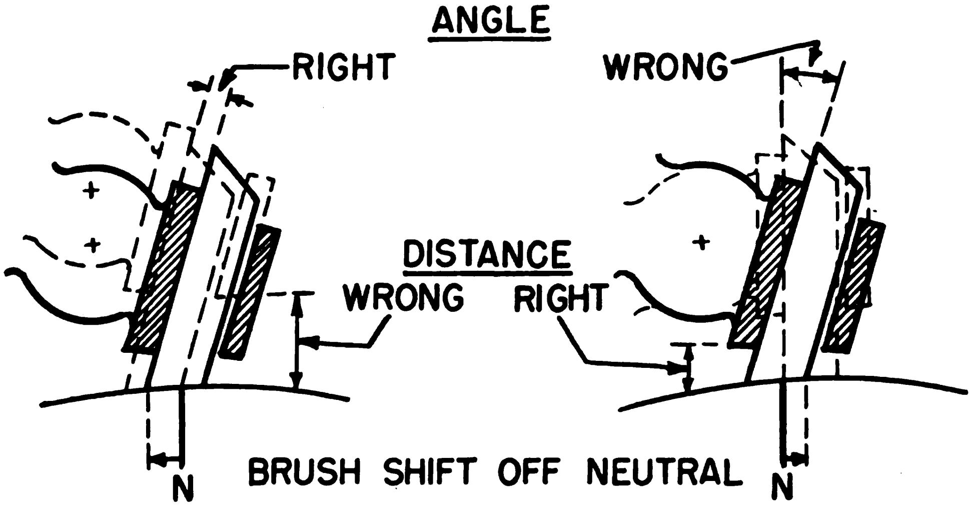


Fig. 9—Reaction type brush holder

this distance gets too great, the commutator surface drag will have enough leverage to cramp the brushes, see Fig. 8.

One-Way Running

When, as in a generator, the commutator always turns the same way, it is possible to use the types of brush holders shown in Fig. 9. These hold the brush against one side of the box to keep it from cocking and chattering. In the trailing type, the brush is held against the box by the action of the brush spring and the angle the holder makes with the commutator surface. The stubbing (leading) type, also holds the brush against one side of the box, but directs it against (instead of with) the direction of commutator motion.

The brush box clearance in this type of holder can be quite large because normally the brush touches only one side. This side must be flat to hold the brush steady. If it becomes rounded, the brush will tend to seesaw. This condition may be the result of wear or may be caused by careless cleaning of the brush box with sandpaper or a file. Of course, you cannot get a good contact at the commutator surface if the brush rocks back and forth in the box.

The angle of such brush holders is important. It depends upon the brush grade, commutator speed, spring pressure, etc. The builder fixes the angle to obtain the best brush operation. Whenever you remove brush holders for maintenance, be sure they are replaced at the proper angle.

Hold That Neutral Point

The brush holder angle must be watched for other reasons too. For best operation, brushes should contact the commutator at a definite point called the electrical neutral. Even though you can't see it, this point is a real thing—just like the timing of your auto engine. If the brushes are not at this position, the output of the machine will be affected. A motor will have its speed under load changed, and a generator will have its voltage affected. Brushes set "off neutral" will show up by sparking. This is particularly bad when one set of brushes is out of place in relation to the others.

You can get brushes "off neutral" in several ways. Suppose you set the brush holder too high above the commutator. Because of the angle, the brush will overshoot its proper position, as shown in Fig. 10. The same thing will happen if you let the brush holder twist on its stud. The wrong angle will throw the brush off, even if you get the distance right, see Fig. 10 again.

A jig is usually provided for setting brush holders at the right angle. Sometimes brush holder supporting studs are keyed into the frame and to the holders. Then

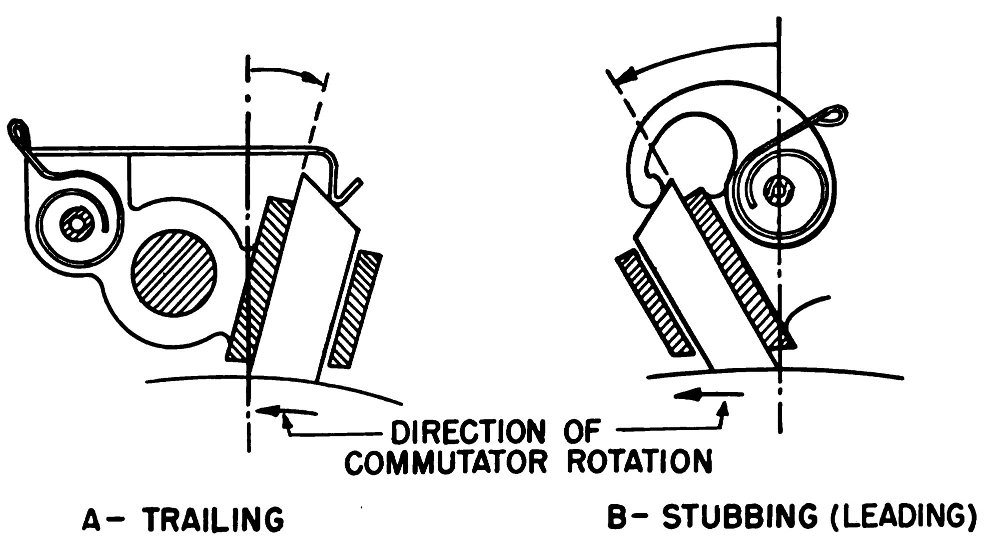


Fig. 10 — Effect of wrong brush holder position

you need only check distance to the commutator. Some machines have the brush rigging on a movable yoke or frame head. You should check this for the neutral mark or key to get the proper position. Many older machines used tramming tools and reference marks for setting brushes. Check this neutral position before you tear anything down so you will be sure to get it back just right.

Be Sure of a Good Fit

If you replace only one or two brushes at a time you needn't sand them in, especially if you are using brushes with faces prepared to approximately fit the commutator. Usually the other brushes will carry the load until the new ones get fitted. But, if you change a large number of brushes at once, you had better fit them, either by sanding or with a brush seater. When sanding, be sure the paper hugs the commutator surface. This will give a sharp fit right to the brush edge. If the machine runs in one direction only, pull the paper that way when finishing the sanding. This may seem like a fine point, but it shows you know the score.

Springs—Handle With Care

Another important thing about a brush holder: keep the right spring tension to hold the brush on the commutator. It should be nearly the same as the tension of its fellow spring in the next holder. If the spring tension in the brush holders varies a large amount, the current collected by brushes will vary also. If the differences are too large, some brushes will overheat and fail.

Tension is affected by wear in the spring mechanism, dirt between the hinge and shaft, and overheating of the spring. It is good to check spring tension occasionally, and to see that the springs are free from dirt or objects that might foul them.

Watch brush length too. If brushes wear too far, the springs will rest on some part of the holders. Then the brushes will be free to bounce on the commutator. Sparking will result that may cause a flashover or damage the commutator and brush holders.

A word of caution: when renewing brushes, either release the spring tension or use a tool for holding the spring. If a spring slips out of your fingers, it can deal a shattering blow to the brush. Even if it doesn't crack the brush right away, this tough treatment may show up later.

One More Play

Supplying the teamwork to back up the brushes is no simple task for the brush holder, but its job isn't over yet. It must keep itself insulated from the frame of the machine, yet be rigidly attached to the frame so that it won't vibrate and cause the brushes to chatter and spark. A megger will serve to check the insulating value of the holders. The only way to be sure they are tight is to get in there with your hands and feel them. Remember, more than once brush and commutator troubles have been caused by loose brush holders.

How It All Adds Up

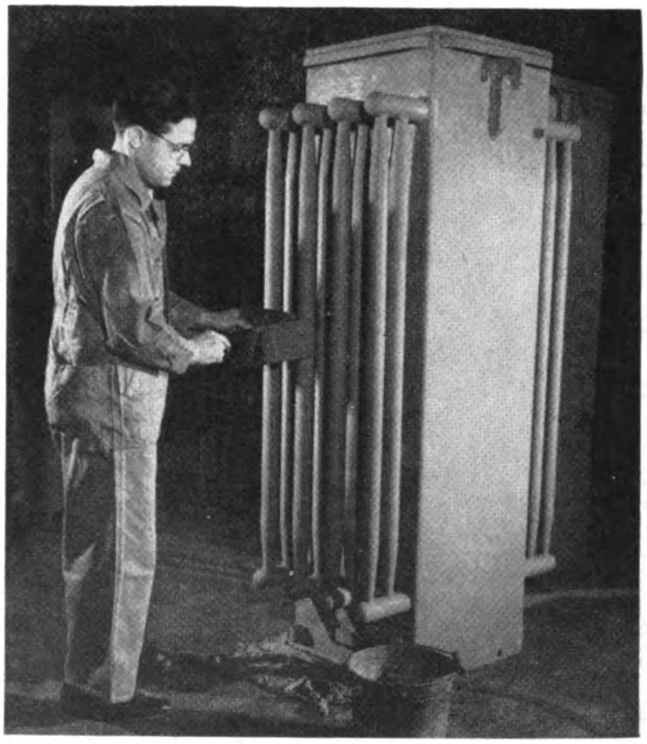
Now, we've seen what each part does and how the brush and holder work together as a team. You, as the coach, can see to it that each part stays on the job to maintain a good score. Keeping this team running smoothly does much to prevent serious troubles, costly overhauls and road failures. So treat that little block of carbon with the respect it deserves.

Britain to Try 50-Cycle Electrification

British railways have decided to carry out a trial of the single-phase 50-cycle a.c. system of electric traction. The trial will be carried out on the Lancaster-Morecambe-Heysham Line, which was originally electrified experimentally in 1908 at 6,600 volts, 25 cycles, the equipment of which is now life-expired. By arrangement with the principal electrical manufacturers, various methods and types of equipment are to be tried out, and the overhead line voltage will be varied from the present 6,600 volts up to and including 20,000 volts.

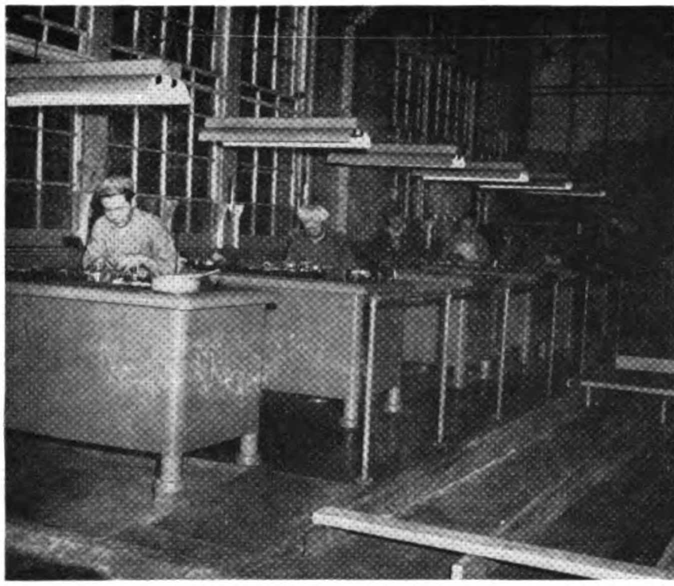
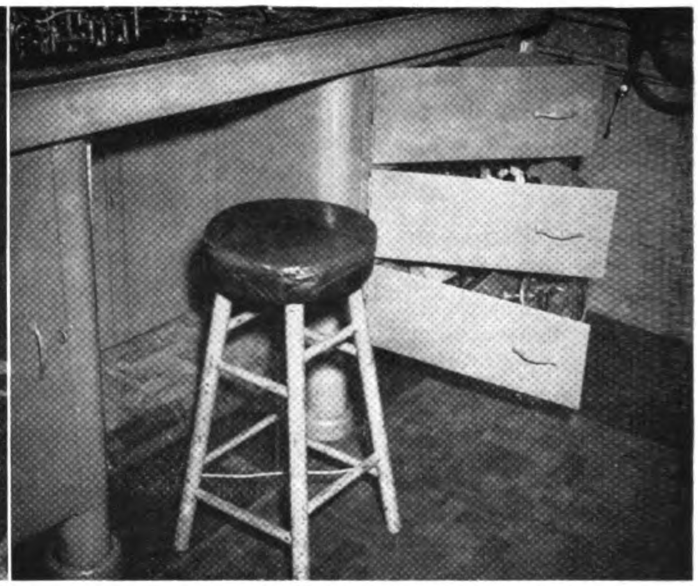
This traction system is being considered for secondary lines, the recommended system for lines carrying heavier traffics being 1,500 volts d.c. overhead. It introduces special problems, but also several advantages, including the use of a lighter overhead system, fewer and simpler substations and the absence of power cables alongside the track. As a result of recent advances in technical development, it may now have a wider field of economic application.

This experimental electrification will provide experience of the suitability of standard frequency a.c. electrification for conditions in Great Britain.



Transformer Painting Kink—The operation shown in the illustration was developed in the Westinghouse Electric plant at East Pittsburgh, Pa., for painting the backs of transformer radiator tubes. It is used to supplement a paint spray gun because the gun cannot be maneuvered between the tubes, and th transformer shell, and its use is messy, incomplete and time consuming.

A strip of rubber gasket material is dipped in paint and used as shown to coat the backs of the tubes. The tubes get an even continuous coat, and the process saves paint and time and promotes morale by relieving the operator of an onerous job.

Left: Six steel work benches which expedite work at the Southern Pacific electric shop. Right: Details of one of the benches

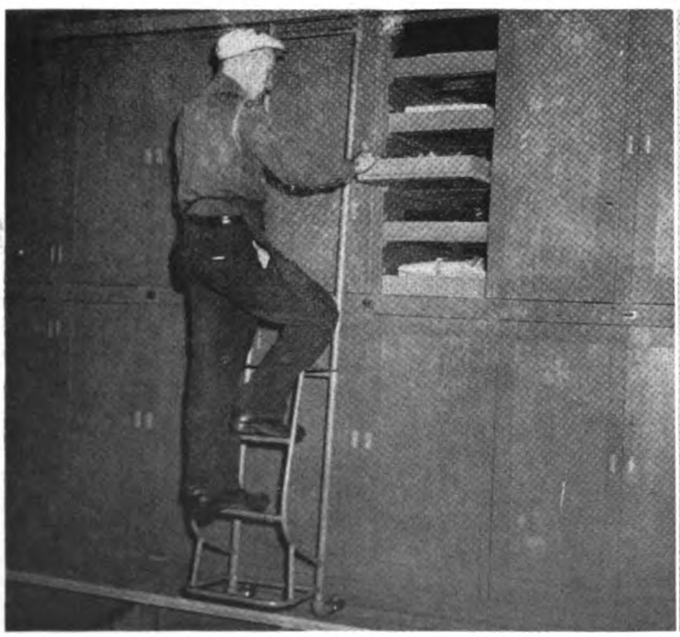
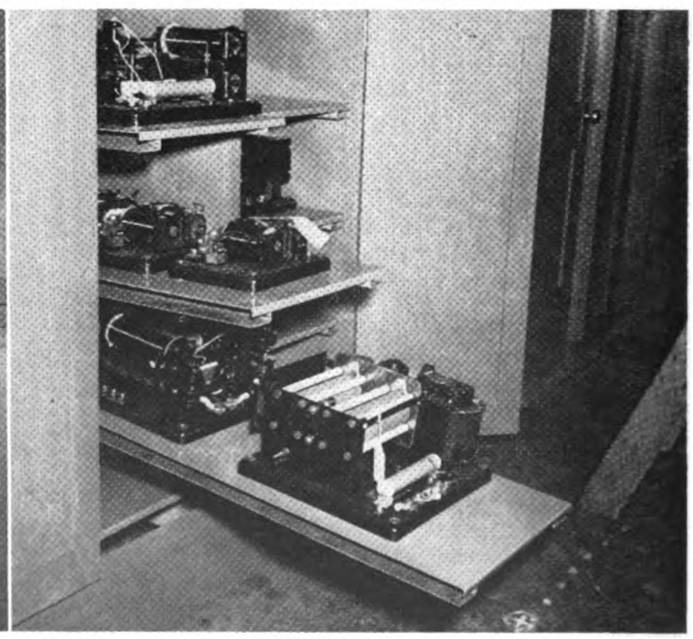
Benches and Shelves for Control Equipment Repair

Among improvements in the Southern Pacific electrical repair shop at Sacramento, Calif., are six steel work benches especially designed for maximum convenience in performing the variety of intricate repair operations involved in maintaining small electrical parts, such as are used in various types of control equipment. Attention has also been given to the design of locker and shelf space for the storage of materials and of electrical parts which have been conditioned.

The first two work benches in the line-up are used for repairing air-conditioning panel units and thermostat controls; the third and fourth benches for cooling fans and blowers; the fifth bench for diswashers, Waukesha starters and expansion values; and the sixth bench for motor-alternators and ice air-conditioning pumps.

Each of the work benches is 36 in. wide by 37 in. high by 7 ft. long, and each is equipped with three swing drawers at the right, three shelves in a cabinet at the left, and three shallow shelves behind swing doors in the center cabinet underneath the bench top which is covered with linoleum. The sides are painted green with orange trim. A foot rest is provided at just the right elevation with respect to the stool. The swing drawers at the right and the door at the left may be locked. The lower two of the swing drawers are interlocked with the upper drawer, and the latter is equipped for padlocking.

Wall space in the electric shop is utilized for cabinets

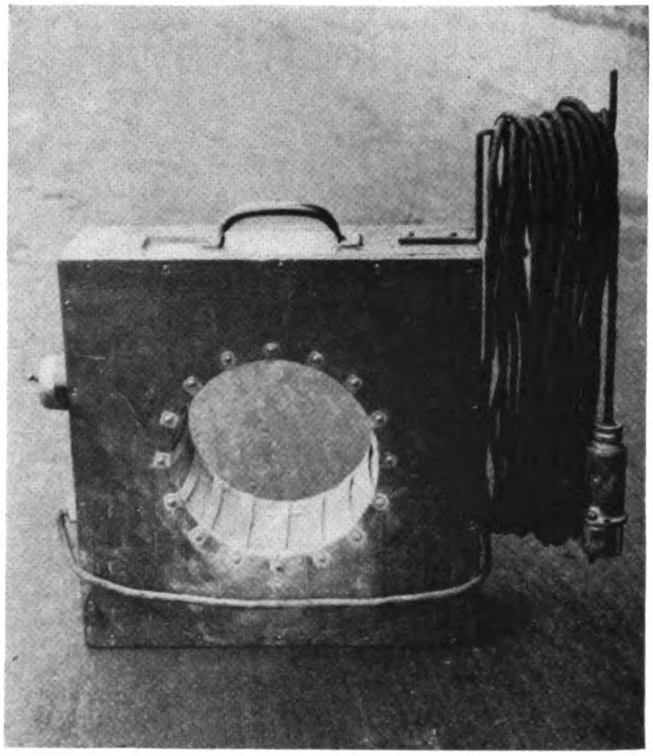



Left: Lockers with sliding shelves for storing materials and electrical parts. Roller ladder gives easy access to upper cabinets. Right: Repaired electrical equipment on sliding shelves

equipped with sliding shelves and trays of all sizes and shapes required to hold new material and repaired parts. A 42-ft. wall space is utilized for this purpose and equipped with double-deck cabinets 8 ft. high.

The lower cabinets can be reached from the floor, and a roller bearing ladder, suspended from a garage track at the top, and bearing against a steel side track at the bottom gives access to the upper shelves.

The shelves are made of 14-gage steel with a welded bracket on each side. Shelves intended for the storage of heavy parts are equipped with roller bearings.



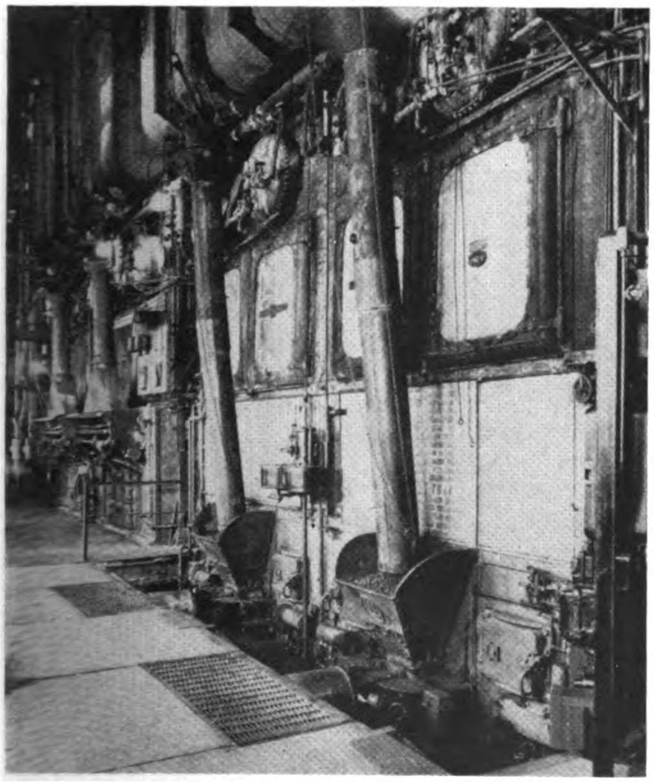
Journal magnetizing coil used by the Rock Island at Armourdale, Kans., for magnetic particle inspection of journals after they have been turned down to remove a cut condition. The box has 175 turns of No. 14 wire wrapped around the drum which slips over the journal. A pilot light tells when the current (110-volt a.c.) is on. The small steel bands protect the fiber core

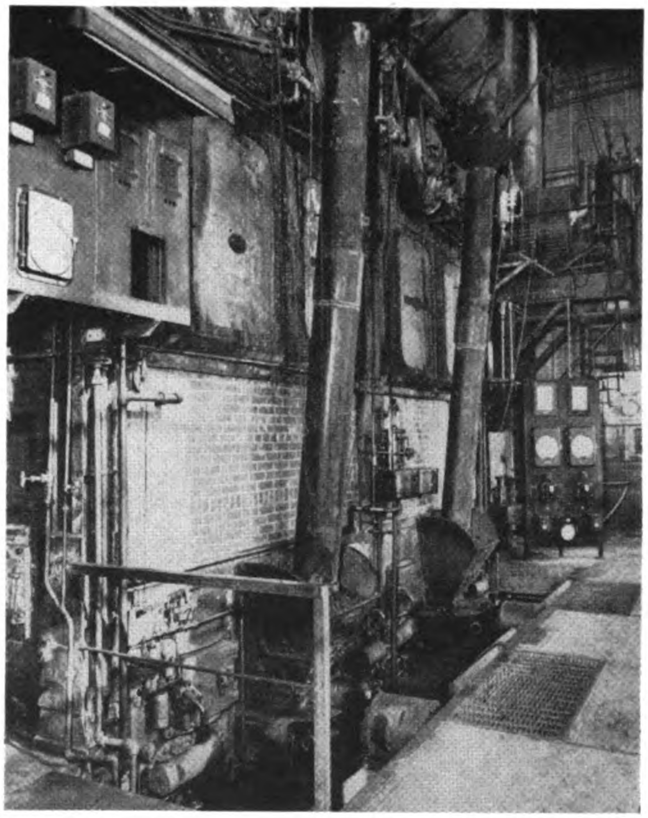
Stokers for Pennsylvania's Pittsburgh Station

The Pennsylvania is modernizing its steam generating plant at the Pittsburgh, Pa., station by replacing four 50-odd-year-old Roney stokers with Westinghouse single-retort, side-dump, underfeed stokers. The plant supplies the electrical and steam requirements for the passenger station and yards.

The Roney stokers, natural draft units, required premium coal, whereas the Westinghouse single-retort stokers permit a wider selection of fuel.

In addition to this fuel advantage, the new stokers will increase the capacity of the boilers about 50 per cent. Although the Roney stokers could produce maximum boiler outputs of from 100 to 125 per cent of nominal boiler rating, the single-retort Westinghouse stokers will produce maximum boiler outputs of about 175 per cent of the nominal ratings of the boilers with which they will be used. The battery-set boilers, two boilers on a common wall, are 300-hp., straight-tube, longitudinal-drum units.





Left: Two Westinghouse stokers that have replaced Roneys such as those in the background. Above: The two new single-retort stokers, with the operating instrument panel in the background

CONSULTING DEPARTMENT

Diesel Electric Locomotive Batteries

Questions and Answers

Q.—What effect does it have on the rest of the batteries to replace an old cell with a new one?

A.—A new cell will have a higher Counter EMF than the old cell, due to aging of the older cell.

Q.—Is it a good practice to make up a battery of trays of different age cells?

A.—No—only as an emergency spare.

Q.—Is it permissible to use taps from the battery for different voltage equipment?

A.—Tapping into the battery for lights will result in an unbalanced condition of the battery, causing cells included in the lighting tap to be lower in voltage and gravity than the balance of the battery. It is far better to use the entire battery with resistance for the light load.

Q.—Is it best to use the rotating cell method when taking pilot cell readings, whereby a different cell is used for each reading until the rotation covers the complete battery?

A.—Yes. It is recommended that pilot cells be changed once a month.

Q.—If abnormal conditions are found, should the battery representative be called?

A.—Yes.

Q.—Is there any difference in life on locomotives which operate continuously with the same side of the locomotive to the sun between the two halves of the batteries?

A.—There may be a small difference, but the difference is so slight that it is doubtful whether this will ever become a factor in the life of a storage battery.

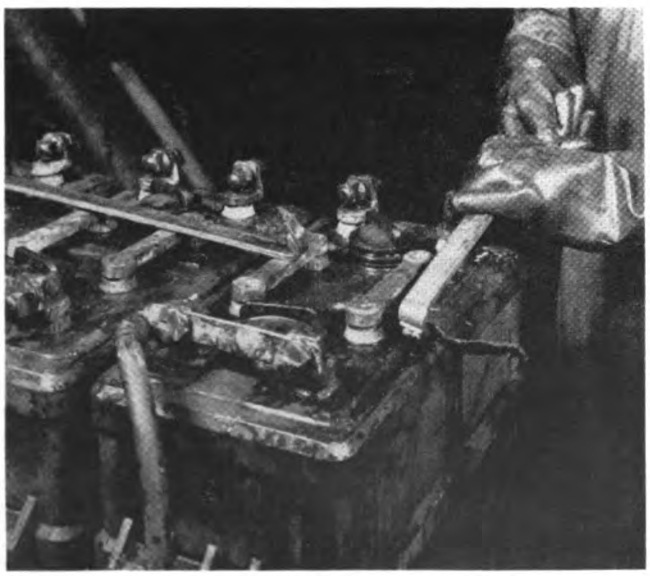
Q.—Will wood or monobloc trays be more satisfactory?

A.—The monobloc tray gives more satisfactory service, in that the electrolyte does not affect the rubber trays.

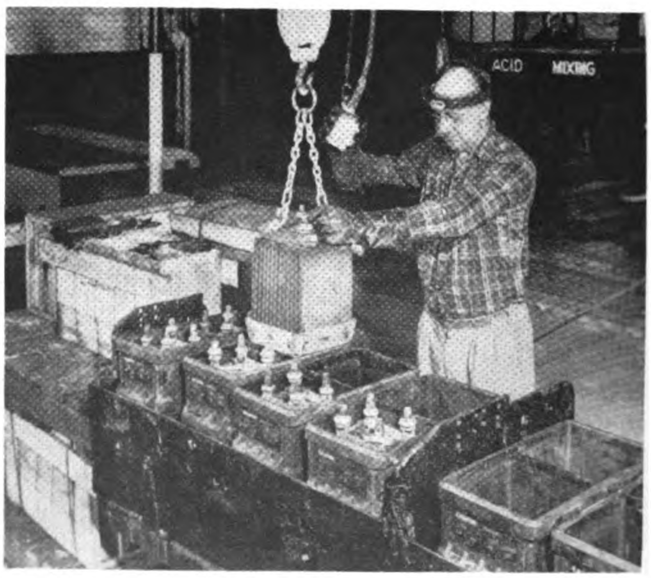
Can you answer the following questions? Answers should be addressed: Electrical Editor, Railway Mechanical and Electrical Engineer, 30 Church Street, New York 7.

The tester for G. E. diesel locomotive governors, developed by the Erie, and described in your December 1951 issue provides a simple and quick way of making tests. But, is it complete? Are there not other checks which need be made to insure satisfactory operation of the governor?

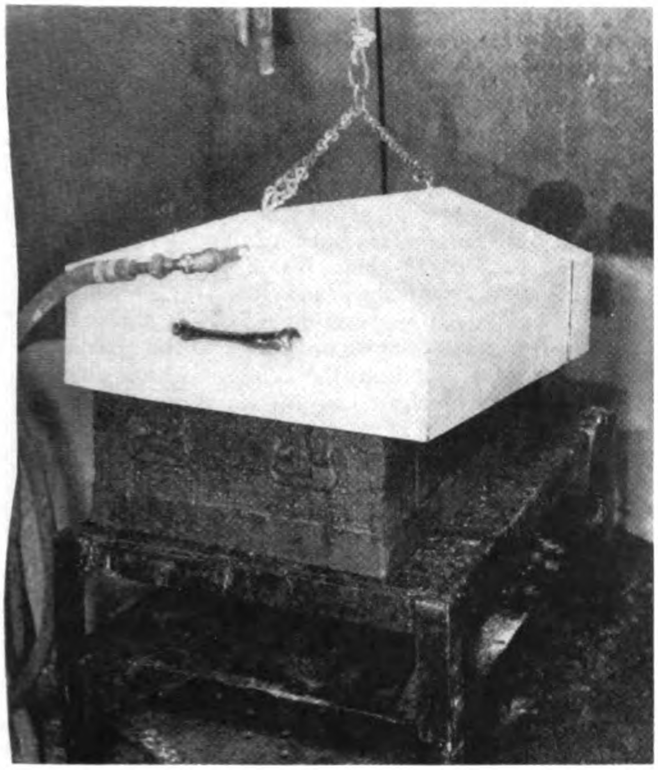
We got a "Megger" instrument reading on a locomotive of 30,000,000 ohms (30 meg.) with a 500-volt d.c. Megger. Then when we tried to hi-pot it, the circuit breaker kicked out at about 450 volts (across the hi-pot leads). With this same high megger reading on the locomotive, we tried an old bell ringer and the bell was quite loud. We measured the output of the bell ringer with a 1000-ohm per-volt voltmeter, and the voltage across the leads was only 100. Why would bell ringer ring so loudly when the resistance reading is so high? Is it true then that no matter how high the resistance is to ground, one is not sure the equipment will stand a high-potential test? This happened to us three different times on different locomotives. One time with a "Megger" instrument reading of 30, another of 20, and the third one of 15.



Old compound should be removed, the acid between seal should be neutralized, sealing surface dried before new compound is added



Upon removal from the jar or the tray, elements should be placed in a stone or rubber container and covered completely with water



Steam cover used to warm compound before removal and to heat space between covers and jars before pouring new compound

Q.—When wood trays become acid soaked, is it possible to prevent ground readings?

A.—The only way that this can be accomplished is to insulate the entire battery from the compartment.

Q.—What tools are recommended for battery maintenance and inspection?

A.—a. Hydrometer
b. Thermometer
c. Model 280—Weston voltmeter
d. See Gould maintenance manual—GB-748, page 22

Q.—In resealing a battery, does it hurt if some compound runs into the cell?

A.—Yes. Th's can cause active material to collect and bridge across from one plate to the other, eventually shorting out the cell.

Q.—Should you try to remove it?

A.—Yes.

Q.—Can you get a good seal by pouring new compound over cracks?

A.—No. Old compound should be removed, the acid between seal should be neutralized, sealing surface dried before new compound is added.

Q.—Should battery be heated before pouring new compound?

A.—The space between the covers and jars should be warmed.

Q.—How can you stop a leak in a monobloc container?

A.—It is impossible to repair a monobloc container and the entire container must be replaced.

Q.—What precautions shall be taken when trays or jars are broken to prevent damage to the elements?

A.—Upon removal from the jar or the tray, they should be placed in a stone or rubber container and covered completely with water.

Q.—Should spare batteries and spare trays be carried for emergency and in what ratio to the number of locomotives in service?

A.—Approximately one tray for every five locomotives.

Q.—Is it satisfactory to use a unit of a different capacity while the regular unit is being repaired?

A.—As a temporary measure this is satisfactory.

Q.—What good does it do to keep records?

A.—Records enable the battery manufacturers representative to review the operation and point out any problems which you might have or might encounter due to the type of maintenance. Naturally, records will enable you to get better battery life and performance.

Q.—What kind of battery records should be kept?

A.—Refer to Gould Record Card.

Q.—How often should a complete specific gravity and voltage reading be taken?

A.—A complete gravity and voltage reading should be taken every 30 days.

Q.—Is it important to record the temperature and height of the electrolyte when taking readings?

A.—Yes.

Q.—How often is it necessary to check every cell and how should this check be made?

A.—Specific gravity and voltage checks should be sufficient—every 30 days.

K. A. Vaughan
Gould Storage Battery Corporation

Cleaning and Testing of Locomotive Electrical Equipment*

Questions and Answers

Q.—Can traction motor overhaul periods be extended if the proper tests are applied to determine whether or not it is in need of an overhaul?

A.—It is recognized that bearings are the main consideration and reason that it is now impractical to extend overhaul periods. A motor run to check the bearings is not sufficient examination and a tear down inspection must be made at least every 300,000 miles. Test motors are being run to higher mileages, but these tests are very limited and carefully controlled. The point is that, if a motor is torn down for bearings, it is considered practical to then give it a dip, and bake, and regular processing, and thus there is now little need for more complicated tests to tell whether or not the motor requires a tear down; also, there is doubt as to whether any kind of test would determine whether or not the banding wires are tight; however, looking to the time that bearings can be run to greater mileages, such instruments as the ducter, high frequency machine, and surge induction tester, are being closely watched, and we are wondering how to evaluate these tests.

Q.—Is it practical to run with the ground relay knife

*Material presented by the Diesel Electrical Committee at the annual meeting of the Locomotive Maintenance Officers Association held in Chicago, September 17-19, 1951.

switch open in case of a ground known to be a moisture ground?

A.—The answer to this is an unequivocal "no" except where it is necessary to clear the main line. Also, personnel would not usually be available to determine definitely whether the ground is one of moisture.

Q.—What is the highest practical ground relay setting?

A.—This question seems to offer no particular problem and the manufacturer's recommendation is regarded as satisfactory, except to those railroads which regularly operate through severe winter weather conditions. Among these railroads, there is a growing feeling that the ground relay is more of a detriment than an asset, and that it either should be eliminated or adjusted to the highest setting practicable. One railroad is using a 3-amp. fuse in parallel with the ground relay coil on its passenger locomotives. Another railroad reports the following experience: Two passenger locomotives were equipped with a midpoint grounding system with approximately 60 ohms on each side of the midpoint. Normal pick-up value of the ground relay coil was 110 milliamperes. Theoretically ground pick-up could be obtained when a 9,000-ohm ground defect existed with a main generator voltage of 1,000 volts. On February 24, 1951, the tripping value of the ground relays was increased to 500 milliamperes. With this pick-up value, a theoretical ground defect of 2,000 ohms would be required to pick up the relay. At this time, all four power plants had ground readings above 5 megohms. A trip made on February 25 demonstrated that the protection was still effective even with the ground relays set up as it tripped several times due to traction motor brush pigtails being broken, permitting them to touch the frame of the motor. After the defective brushes were replaced, no more trouble with ground relay tripping was experienced. The next pertinent observation came between March 14 and 16, when the two locomotive units were operated north without any trouble through severe snow conditions, which were causing ground relays to trip on other locomotives operating through this same locality.

When the test locomotive arrived at its home terminal after this trip, the general ground readings of the high voltage systems were as follows:

No. 1 engine 10,000 ohms
No. 2 engine 50,000 ohms
No. 3 engine 30,000 ohms
No. 4 engine 50,000 ohms

The grounds were not cleared and the locomotive was dispatched out in the next train on the same night, March 16. During this trip again very severe conditions were encountered, and no ground relay trouble was experienced. Upon arrival at its home terminal again on the 18th, the ground readings of No. 1 engine had cleared up to 200,000 ohms, No. 2 engine 1 megohm, No. 3 engine 400,000 ohms and No. 4 engine 300,000 ohms. As before nothing was done to clear the grounds and locomotive went out again on the 20th, arriving at its home terminal again on the 22nd, at which time the ground had further cleared up to: No. 1 up to 30 megohms, No. 2 up to 30 megohms, No. 3 up to 5 megohms and No. 4 up to 30 megohms. Another megger test made seven days later showed that all four power plants had cleared up to 50 megohms or better.

In other words, due to the ground relay tripping value being increased to 500 milliamps., the locomotive operated with full power through the most severe weather conditions with no trouble whatsoever even though the dielectric strength of the insulation at one time was as low as 10,000 ohms to ground. Further, the locomotive cleared itself up through its own heat and ventilation with no cost to the railway.

Q.—How should wheel slip relay be tested? Have you experienced a specific case of unbalanced motor field shunting resistors causing a false wheel slip indication?

A.—The wheel slip relay is an important device and should be tested regularly. The test should include the entire wheel slip circuit so as to detect any defective external wiring, bridging resistors, or connections. All committee members reported that they had had no cases of false wheel slip indications due to unbalanced shunting resistors, with the exception of two who each said they had had one case, and another who reported that all false wheel slips are caused by this type of unbalance and implied that it occurs to a considerable degree.

An American-built diesel-electric locomotive which has been in service in Algeria since 1946. Diesels continue to replace steam locomotives in Morocco, Algeria and Tunisia. Four new 1500-hp. diesel road switchers for Algeria and two for Morocco were recently delivered by the Baldwin - Lima - Hamilton Corporation, making a total of nearly 100 units for the three countries. Almost all of the 1,500 miles of main line are dieselized. The maximum speed of the Algerian units is 75 m.p.h. which is regularly attained by passenger trains on long tangents between Algiers and Oran. Diesels operated on the 300-mile line running from Oujda south to the Sahara desert are equipped with special rotary air cleaners

EDITORIALS

1951 INDEXES

The indexes for the year 1951 will appear as part of the April, 1952, issue of Railway Mechanical and Electrical Engineer. For the benefit of those who may wish to bind their copies, separate indexes will be furnished upon request.

A Watered-Down Freight-Car Program

The year 1951 was marked by a continuous struggle on the part of the Defense Transport Administration and the American Railway Car Institute to get steel enough in all components to attain the goal of 10,000 new freight cars a month set up by the D.T.A.

During October 1950 James K. Knudson, administrator, D.T.A., announced a program calling for the building of 227,400 new freight cars by June 30, 1952, with which it was contemplated that an increase in Class I railway freight-car ownership of 75,600 cars could then be attained. Later in the month the N.P.A. announced the establishment of a program to provide steel products in sufficient quantity during the first quarter of 1951 to build new freight cars at the rate of 10,000 a month. In this announcement, however, it was set forth that producers of steel are not required to accept certified orders under the program if received less than 45 days prior to the first of the month in which shipment of the steel is requested, unless the N.P.A. specifically requests that such orders be accepted.

On January 17 the N.P.A. issued an order establishing a procedure "to assure the prompt delivery of steel products needed for the production of new freight cars at the rate of 10,000 per month." But, before the end of February the N.P.A. advised steel producers that May allocations would reduce the new freight-car program to 9,000 cars a month. By the middle of March, expectations were revived that steel allocations sufficient to restore the output of 10,000 cars per month would be made for June. (Senator Thye, in a Senate speech on March 12, said that he had written Director C. E. Wilson of the Office of Defense Mobilization urging re-establishment of the 10,000-car program.) Actually, 308,000 tons of steel were allocated for June as compared with 310,000 tons per month allocated for new freight cars during the first quarter.

Late in May, a tentative program was announced which would provide for only 7,000 to 7,600 cars per month during the third quarter. This cut may have had some political repercussions and, early in June, Mr. Knudson announced an increase in the third quarter program made possible by adjustments in the steel allocation plan, the allotment of a "little more" steel (said by N.P.A. sources to be 11,000 tons) and the extension of "direct-assistance" arrangements for the procurement of castings which it was understood would step up the program to 9,500 new cars per month.

The fourth-quarter steel allocations contemplated continuing a production of 9,500 new cars per month.

For the first quarter of 1952 the N.P.A. announces a program of 24,200 new freight cars, but "because of an acute shortage of material," allots steel for only 21,200 cars. This is a program of 8,066 cars per month, with steel for only 7,066 cars per month.

In interpreting these allocations two facts must be kept in mind. First, the steel industry is not required to accept orders for steel placed less than 45 days in advance of the month of delivery, and, second, the lead time in the car-building industry is approximately 90 days. It is evident, therefore, that car deliveries are not likely to begin earlier than between four and five months following the actual placing of the orders for steel.

By comparison with freight-car deliveries during 1950 the past year shows a marked improvement. Approximately 95,000 new freight cars were turned out by the car builders and railroad and private-car line shops during 1951. In 1950 the output was 44,000. But compared with the goal of 10,000 new freight cars per month, the 1951 output shows a deficiency of 25,000 cars, and the increase in Class I railway freight-car ownership during the year was approximately 31,000.

The freight-car supply was inadequate at all times during 1951. Large shortages were reported during January to April. While shortages were less acute during the remainder of the year, substantial shortages were continuous.

If first quarter allocations are any criterion of what is in store for the railroads during the remainder of 1952, an increase of less than 20,000 cars will be attained by the Class I railroads during the year; there is little reason to anticipate an adequate improvement in freight-car supply. The easy reduction in bad-orders has been pretty well discounted during 1951. Car-miles per car day, tons per loaded car, and average net ton-miles per freight-car day all show marked improvements during the first three quarters of 1951 as compared with 1950 and offer little hope of ready improvement in freight-car utilization in 1952.

The major hope for an improvement in freight-car supply lies in the program announced by Mr. Knudson in October 1950 calling for the building of 227,400 freight cars by June 30, 1952, which, it was contemplated, would increase the Class I freight-car ownership by 75,600 cars.

Maintenance Costs Will Come Down

The things a diesel-electric locomotive needs to keep it running under all service conditions were listed recently by a railroad operating man in speaking before a group of automotive engineers. He said that things have to be arranged so that a man who, for the past 40 years, has shovelled coal into a steam-locomotive firebox can, with a few hours training, find trouble when it occurs, and correct it so the diesel locomotive will then proceed with normal operation.

Someone less sophisticated than the speaker might take that statement much too literally. This is not to say that the speaker had his tongue in his cheek when he made it, but instead was trying to tell what the railroads should have if they could have what they really wanted. In regular operating practice, there are very few things either the fireman or the engineman can do to correct trouble. They are not schooled to do such things, and operating requirements preclude their doing very much.

The situation among the maintainers themselves is still not as good as it can be. Many have been taught about the intricacies of a diesel-electric locomotive in the manufacturers' schools, and with the aid of the railroads' own schools and demonstration cars. The greatest obstacle arises when the subject is electrical. Even among the supervisory forces, a day in school with Ohm's law is a grueling experience. By the time the subject is carried along to the formula for parallel resistances, many of the students are in a state of great confusion.

The reason, of course, is that most of these men have a mechanical training and are without the background that makes electrical problems easy. Actually, they do a remarkable job of maintaining locomotives, even including electrical equipment. As one maintainer said to another, "I can shoot trouble all right, but I want to know more about what I am doing." Another replied, saying, "If I could shoot trouble, I wouldn't care if I knew what I was doing or not."

The answer to the problem is obviously continued education of the kind that is being carried on right now. The locomotives are running without a distressing number of failures, but it must be that trouble from electrical causes is greater than it should be. Certainly, if the present courses of teaching are continued intensively, a reduction in electrical maintenance costs can be expected.

NEW BOOKS

FUEL OIL MANUAL. *By Paul F. Schmidt. Published by the Industrial Press, 148 Lafayette street, New York 13. 160 pages, 6 in. by 9 in., bound in Fabrikoid. Price, $3.50, plus 40 cents postage Canada or overseas.*

Until recently the problems related to purchasing, storing and using diesel locomotive fuel were very largely confined to securing fuel oil which met the specifications recommended by the builders. As the quantity of diesel fuel used by the railroads has increased, other demands for the so-called "middle distillates," particularly for space heating, have also increased and an adequate supply of fuel meeting the builders' highly restrictive specifications is becoming less readily available. Modifications of these specifications to increase available sources of diesel fuels are becoming desirable, and a thorough knowledge of liquid fuels by all having to do with their purchase and use comparable with that long employed in the purchase of coal is becoming necessary. The Fuel Oil Manual, while not specifically dealing with diesel fuel, covers the entire range of fuels obtained by refining crude oil. The treatment is non-technical, but readily understandable and complete in its scope. The essentials of petroleum chemistry and refining processes are set forth briefly and various grades and types of fuel oil described. A chapter is devoted to each measurable quality of fuel oils and in it the method of determination and the scale of its measurement are described. The last nine chapters are devoted to problems partaining to storage and handling, including preheating of oils, sampling storage tanks, and the compatibility and stability of fuels when mixed in storage, the employment of additives, and others.

A TREATISE ON MILLING AND MILLING MACHINES. *Third Edition. Published by Cincinnati Milling Machine Company, Cincinnati, Ohio. 896 pages. 6¼ by 9½ in. Cloth bound. Price, $8.00*

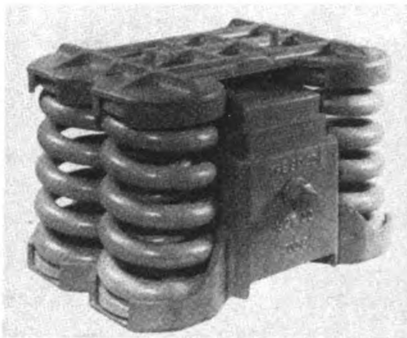
This third edition of the Treatise on Milling and Milling Machines has been brought out to meet the needs of individuals in metal working shops, technical schools and universities. In this 896-page volume is included the accumulated experience of many years in the application of milling machine equipment which has been brought up to date by revisions and additions to the material published in prior editions. Like its predecessors the new "Treatise" describes, in a comprehensive manner, the most advanced types of applications, milling machines, milling attachments, cutting and cutting fluids as well as the design and types of fixtures used in tooling these machines for production.

Included in the volume are 200 formulas for solving various problems encountered in shop practice and the text is further amplified and clarified by the use of 700 illustrations and charts. Throughout the volume numerous specific examples illustrate milling machine equipment in use in production, tool room and die-sinking work. These applications of milling machines to the manufacture of diversified parts in both large and small quantities have been brought together in this volume by the cooperative efforts of the publisher's engineering service department and industry at large. Tabular data, charts and information on milling-cutters and their use are based on metal cutting research, which, for many years, has been carried on by the Cincinnati Milling Machine Company's research department.

Barber Truck-Spring And Stabilizer Unit

The Standard Car Truck Company, Chicago, has developed a new "Package-Group" spring and stabilizer unit for the trucks of existing freight cars and placed it on the market after more than a year of successful test service on Canadian railroads. Principal objectives sought in the design include adequate strength and wear resistance to assure a number of years of trouble-free service, flexibility enough to avoid excessive wear and breakage under heavy transverse shocks, and self-squaring and easy riding even on secondary track at speeds up to 80 m.p.h.

The unit is simple in design, using the increasing downward friction principle of Barber stabilized trucks, fairly light in



weight for ease of handling, and adaptable to spring-plank and spring-plankless trucks of all 40- and 50-ton types.

The entire housing and top plate are malleable iron of heavy section at all points of stress. Hardened wear plates are secured to the housing by bolts of ample size, nuts and lock washers.

The alloy friction shoes, designed for long life and high energy absorption, are cup-shaped partially to enclose the actuating alloy springs. They are forced against the wear plates by wedges similar in function to the wedge-shape pockets of Barber stabilized trucks. The load-carrying spring, with $2\frac{1}{2}$-in. deflection and $5\frac{1}{4}$-in. outside diameter, will fit into spring-plank trucks as well as spring-plankless types, provision being made for the top plate to clear all types of bolsters.

The units are therefore well adapted to give old-type A.A.R. trucks an additional life with improved riding qualities for modern high-speed operation at much less than the cost of new trucks.

Electronically Controlled Car Heat

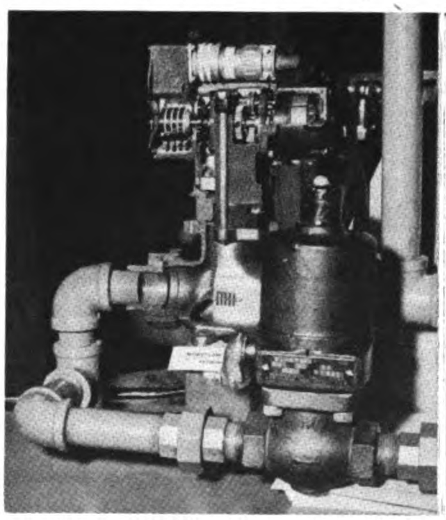
An electrically controlled heating system for railway sleeping cars, recently introduced by the Minneapolis-Honeywell Regulator Company, combines overhead and floor heat units to produce comfortable temperatures in the car under all kinds of outside weather conditions.

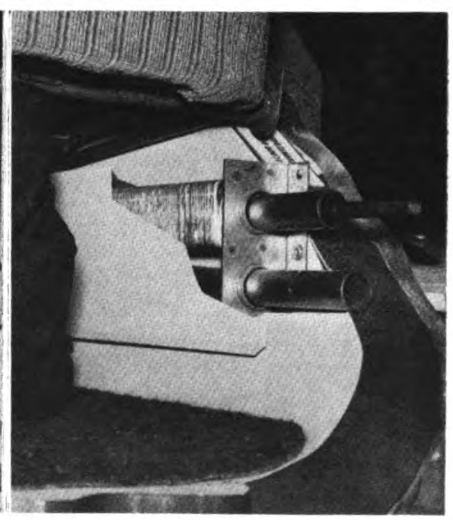
Electronic thermostats control a single moduflow steam valve for the car's entire heating and cooling system. The steam output from this valve is uniformly divided between the overhead and two floor heat systems. The principal function of the floor heat is to continuously counteract the effect of cold outside walls and windows. Its output is approximately equal to transmitted heat loss of the car. With this large portion of total car heat loss replaced, the overhead air can then be introduced at a temperature very close to the desired car temperature.

For individual car-room temperature control, a special booster system was developed. Basically, the booster system varies the discharge air temperature in each room to suit the passenger's individual preference. By adjusting a pneumatic switch, the passenger can regulate the flow of hot water through the booster coil and thus have direct control of the temperature of the air supplied to his compartment through the ducts. Positioning the pneumatic switch causes the overhead valve serving the booster to be opened or closed. Air pressure to the valve determines the valve opening and the amount of hot water flowing in the coil. Once adjusted, the room temperature remains stable regardless of changes in outside conditions.

Steam from the trainline passes through a reducing valve and is reduced in pressure before being used in the system. It is then metered to an overhead coil and the two floor heat surfaces by the moduflow valve. This valve surface distributes the heat over the full length of the finned floor heat surface. Even when they are operated in mild weather with low surface temperatures, their heat distribution is uniform. This is because of the use of the circulators and the heat exchanger principle of the moduflow surface. The car thermostat with its discharge and fresh air compensators operates through a panel to control heating with the moduflow valve. Cooling in summer is controlled by end switches, operating on the valve's overtravel movement, which turn on the cooling after the steam shuts off. The panel provides conventional switching and terminals for fan and other external equipment. A standby valve provides layover heat without use of the circulators.

From a point ahead of the moduflow valve, steam is taken off for the overhead booster system. The steam passes through a heat exchanger and heats water which is circulated through a closed system the full length of the car. The temperature of the water in the system is regulated by an insertion thermostat which positions a normally-closed steam valve to admit the proper amount of steam to the exchanger.





Left: A cutaway moduflow valve and standby valve, basic elements of the electronically-controlled heating system for railway sleeping cars. Right: Finned tubing used for floor heat. The small tube carries a modulated flow of steam, heat from which is transferred over the length of the car to liquid which is circulated through the larger tubing

In the air inlet to each room in the car, there is a booster coil. The hot water supply to the booster coil is proportioned by a pneumatic valve. Air pressure to the valve opening and the amount of hot water flowing in the coil. In each room, there is a pneumatic switch which the passenger can position to adjust the valve opening on the booster coil for his room. Thus, each room occupant can dial the discharge air temperature in his room for personal comfort.

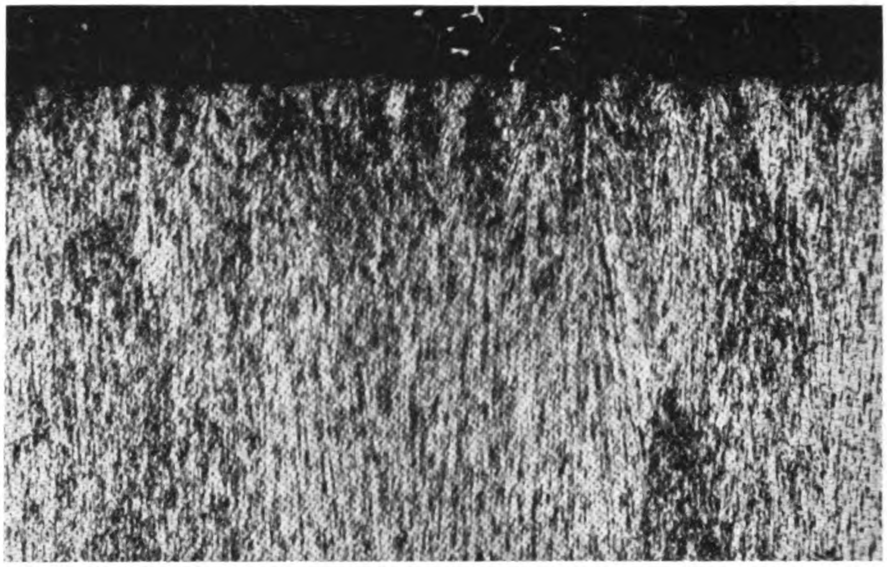
Electrodepositing Cast Iron

The van der Horst Corporation of America demonstrated the application of the Vanderloy M process of electrodepositing cast iron to a group of business paper representatives at Olean, N. Y., on November 14. The process is employed in building up worn cylinder bushings, worn crank-shafts, and other worn machinery parts. The plant for its application, which has recently been placed in operation, is 60 ft. wide by 288 ft. long. Facilities include cleaning tanks, machining facilities for restoring concentricity of bores and bearings, and a production line of baths for preparation of parts and electro depositing the iron.

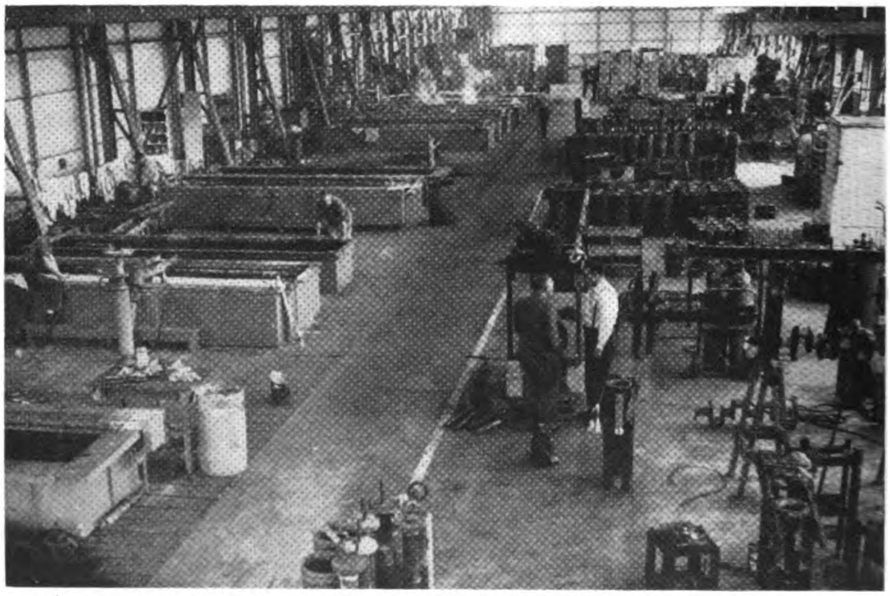
Vanderloy M is the result of a program of investigation of all known methods of electrodepositing iron undertaken by the van der Horst laboratories several years ago. The new electrolytic iron develops a fine columnar structure with the axis of the grains perpendicular to the surface on which the metal is deposited. The bond is established atomically between the Vanderloy M and the base metal and is indestructible. Failure occurs in one or the other of the metals, not at the bond.

The Vanderloy M bath is adapted to the plating of heavy deposits. Deposits can be made of ¼ in. or greater radial thicknesses with neither grain growth nor roughness. The bath is stable and produces these results within practicable limits of current density and working temperature, low enough to permit masking of parts by application of low cost wax.

Applications for the new Vanderloy M plating process so far developed have come largely from users of the original Porus-Krome process now employed extensively on wearing surfaces of new and reconditioned diesel locomotive cylinder sleeves. Used with the Porus-Krome process, the economic limitations on thickness imposed on chrome plating are extended so that parts can be reclaimed after much greater wear than is practical with Porus-Krome alone. Restoration is effected by a heavy deposit of iron surfaced with a light deposit of chrome.



A cross-section of Vanderloy M showing the columnar structure — 100X



Parts are received at the far end of the floor, are cleaned and machined on the right side, and pass through the preparation and plating tanks at the left, from front to rear

Hot-Spray Freight-Car Paint Process

Hot-spray application of freight car finishes was inaugurated on November 28 at the Michigan City, Ind., plant of the Pullman-Standard Car Manufacturing Company, by the Sherwin-Williams Company, in a demonstration witnessed by a party of railway officers and supervisors and representatives of the press. The process, developed as the result of a joint research program of the two companies, utilizes heat instead of thinners as a viscosity reducing medium and employs a hot-spray freight car enamel developed by Sherwin-Williams.

In applying the S-W Hot-Spray Enamel a conventional primer is used prior to the hot-spray application. If desired, however, the primer may also be hot-sprayed, as this

Plan *Now* For Your *Hard-to-get* 1952 Needs

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Analyze your requirements for maintaining that steam power still in service; Castings particularly for ...... superheaters, throttle parts, injectors, etc.

What about plant and shop requirements for small, compact, automatic steam generators ready to install and produce steam in three minutes? Perhaps larger capacity boilers and stokers are up for consideration?

This company designs and builds a wide variety of steam and component products ...ask for particulars.

THE
SUPERHEATER CO., INC.
Division of
COMBUSTION ENGINEERING-SUPERHEATER, INC.
200 Madison Ave., NEW YORK 16
Bankers Building, CHICAGO 3
Montreal, Canada, THE SUPERHEATER COMPANY, Ltd.

ELESCO

insures a more uniform primer viscosity under varying atmospheric conditions and reduces over-spray. The S-W Hot-Spray Enamel is a synthetic finish which contains a much smaller volume of thinners than is employed in conventional freight car paint; because of its higher solids content, one coat of the hot finish is applied instead of two coats of conventional paint. With this process there is better performance and control in application under adverse shop temperature conditions and, because of greater coverage per gallon and elimination of a second coat, utilization of paint-shop capacity and of spray equipment is increased. These factors, and the reduction in direct labor time of applying the finish, result in lowering the cost of overall finishing operations.

The hot-spray system was first applied experimentally in finishing 10 steel freight cars for the Chicago, Rock Island & Pacific in 1948. The hot-spray process demonstrates uniform coverage and hiding, eliminates crawling and blooming of the finish, and shows less tendency to orange-peel, sag or curtain. Commercial equipment for heating the enamel, and the primer if that is to be applied hot, are available from a number of heater manufacturers. Conventional type spray guns are used.

The hot-spray finish is being applied to a lot of 250 steel freight cars for the Rock Island; part of this lot were going through the shop at the time of the demonstration on November 28.

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High Vacuum Hand Pump

Three new industrial units, designed with safety as a prime consideration, have been made available by the Tokheim Oil Tank and Pump Co., Fort Wayne, Ind., for dispensing gasoline and petroleum base products and liquids such as water, glycerin, alcohol, turpentine and other solvents.

All models, Nos. 970, 971 and 972 have bung adaptors with a vise-type screw which can be tightened on the suction stub without wrench or pliers.

Model 970 has a non-drip discharge spout which simplifies filling cans and small containers. It has a baffle in the spout which permits expansion, but prevents the leaking of liquids when the pump is idle.

Model 971 is equipped with 8 ft. static wire hose and a vacuum breaker while the third unit is equipped in the same manner as the No. 971 but with the addition of an 8 gal. flow meter.

They can be installed in 1½ in. and 2 in. bungs of drums and tanks.

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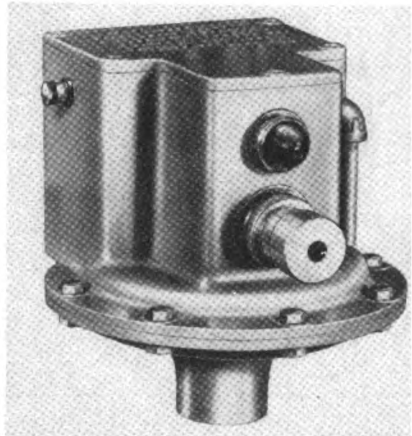

Diesel Engine Protector

A device called the P-M Engine Protector, designed to help prevent crankcase explosions and excessive damage to engines caused by failure of internal parts, has been developed by Paxton-Mitchell Co., Omaha 5, Neb.

The unit operates on a diaphragm principle. When pressure is present in the crankcase, the diaphragm operates a relay which in turn operates the stop relay in the control circuit and automatically shuts engine down. Circuits are provided which operate the low lube oil alarm bell and isolates the unit. Thus, a shutdown of the engine will be effected before excessive damage can be caused by broken liners, pistons, rings or any other cause which would create pressure in the crankcase.

According to the manufacturer, the product can be used on all types of diesel engines. Because it is shipped as a packaged unit, complete and ready for installation with all integral wiring factory assembled, the installation is simple and can be made with a minimum of time.

The unit is sealed, eliminating the possibility of damage from water or cleaning solutions used in washing down the engine.

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High Strength Stud Wolding

There are many advantages to be gained by the railroad industry through the utilization of the Nelweld method of stud welding perfected by the Nelson Stud Welding Division of Gregory Industries, Inc., Lorain, Ohio.

The patented granular flux in the stud makes it possible to obtain instant ionization of the arc stabilizing ingredients in the flux. This results in maximum arc stability and in some instances materially reduces the welding power required. Complete dispersion of the flux over the end of the stud makes it possible for its deoxidizing elements to produce the most effective fluxing action for clean, oxide-free welds.

For box, refrigerator and special purpose car applications, this welding method has been used for side post and door post furring; car end and corner post furring; insulating cleats or nailing strips; perforated liners; securing insulation; hatch cover framing; placard and routing boards. Other applications include securing lading straps and attachments, stanchion brackets and luggage racks, diaphragm curtains, stiffeners and seats.

For the locomotive, there are several applications including securing side panels, smoke box doors, cable and piping, resistor mountings, storm curtains, air horns, covers and inspection plates. Other suggestions could be included as the listing is extensive.

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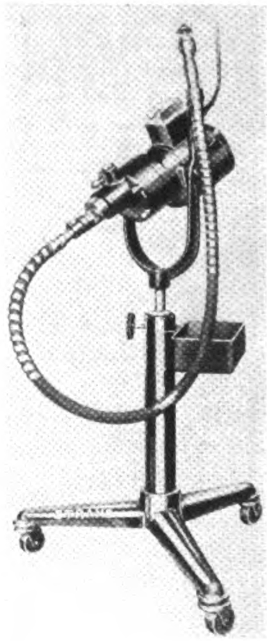

Flexible Shaft For Diesel Work

Flexible shaft tools have been in use in industry to a wide extent and in railroad work to a lesser degree for many years. They are popular with the operator because he lifts only the tool and not the heavy motor, thus avoiding fatigue. The rapidly increasing number of diesels has developed a need for flexible shaft machines in shops and enginehouses.

The Franklin Railway Supply Company, New York, purchased the Strand Company which pioneered the countershaft pulley and belt arrangement making three speeds available for driving the flexible shaft. A recent development is the Strandflex four-speed gear drive arrangement which em-

ploys a quick-change gear drive providing four positive speeds.

The Strandflex drive features two sets of helical hardened steel gears running in lubricant. The selected gears may be engaged by a slight rotary and axial movement of the sleeve for any of the four plainly marked speeds.

With standard speed electric motor the speeds available are 850, 1,800, 3,600 and 4,500 rpm. Using a high speed motor the speeds are doubled so that the maximum is 9,000 rpm.

A full line of accessories is available so that the machine becomes a diversified tool to cover a wide range of every-day maintenance jobs.

Using proper wire brushes the machine is used for cleaning carbon from diesel parts such as pistons, cylinder liners, cylinder heads and valves.

Rotary files and cutters and shaped mounted grinding wheels turn it into a useful addition to the tool room and machine shop where it is used in jig and die making, deburring, rounding sharp corners and other similar jobs.

With sanding drums of various shapes and abrasive bands a wide variety of polishing jobs are done quickly and smoothly.

Shafts up to 30 ft. in length are available so that it is a practical machine for working on the high up car body parts of diesels and cars for grinding down welds, polishing and cleaning driving screws and setting nuts in grilles and cab panels.

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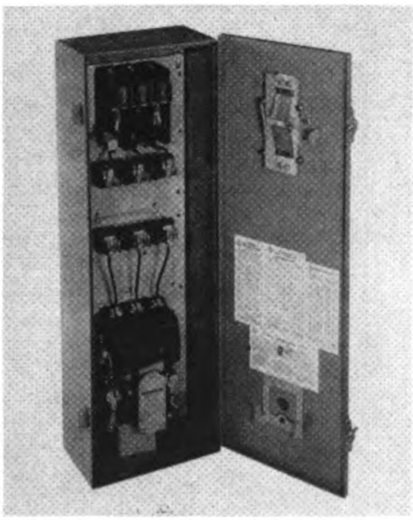

Linestarter with Fusible Disconnect

A new combination across-the-line motor starter with fusible disconnect switch is available from Westinghouse Electric Corporation in N.E.M.A. sizes O through Z.

This starter, designated as Class 11-204-N, consists of a disconnect switch, main line fuse clips, and a Life-Linestarter mounted in a common enclosure. The disconnect switch is of an improved design, with visible blades and De-Ion arc quenchers. A self-indicating, slamproof handle is provided in the cover. It has separate positions of *ON, OFF* and *OPEN COVER*, and can be locked in the *OFF* position by up to three separate padlocks.

Enclosures can be provided for general purpose N.E.M.A. Type I, semi-dust-tight N.E.M.A. Type IA, dust-tight N.E.M.A. Type V, or N.E.M.A. Type XII. Starters are available for 3-phase operation, up to 600 volts, 60 cycles.

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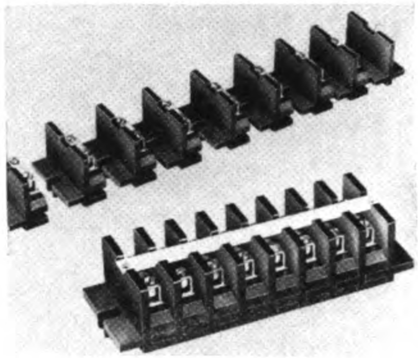

Terminal Blocks

The Wama Company, Industrial Building, Baltimore 2, Md., has developed a simplified solderless connector for its Add-A-Point terminal blocks.

The new connectors simplify terminal installations, and save manpower while assuring a better connection. They will accommodate standard wire sizes from No. 14 to No. 6.

The blocks are rated up to 60 amp. and will operate safely up to 750 volts. Each unit consists of a one-piece point and barrier, an end piece, marking strip and short screws. No through bolts, long screws or individual barriers are used.

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Solvent-Vapor Degreaser

A completely redesigned and improved model of a hand-operated, solvent-vapor degreaser is announced by Detrex Corporation, Detroit 32, Mich. The production cleaning machines included in this new series, identified as VS-800, make use of non-flammable chlorinated hydrocarbon solvents, either trichlorethylene or perchlorethylene for the complete and high-speed removal of oil and grease from all kinds of metal products. The usual cycle of operation is vapor cleaning, then flooding clean solvent over the work with a hand held spray lance, followed by the usual pure vapor cleaning phase which is characteristic of solvent-vapor degreasing.

A minimum of floor space, lower working height, and an efficient new style solvent condenser are some of the improvements featured. As the clean-solvent storage tank is built integral with the main machine body, the new design has made it possible for the inside work space to be cleared of all projections, including the solvent collecting trough, condensing coils, and vapor level control bulb; thus providing unobstructed entrance for work being cleaned. Easy operation from either side of the machine is also made possible because of the relocation of the solvent storage space.

Further refinements include: simplified piping and water separator arrangement, large access door for easy cleaning of the solvent storage section, and a redesigned condenser coil that provides a greater volume of distillate for slushing. A standard heating-door opening is provided to accommodate the interchange of heating means, consisting of steam coils, gas burners or electric elements.

A new, improved type of corrosion-resistant coating, called FF-1, is applied to all interior surfaces of the VS-800 model degreasers. In addition to 21 standard sizes in which this model is available, "specials" will be built to fit individual product requirements.

◆

Adjustable Air Diffusers

Recently announced by the Universal Diffuser Corp., New York 59, is a series of adjustable air diffusers called Flexiflo. This diffuser, with its variable effective area, permits adjustment of the air flow for any setting from zero to full volume or changes in the air throw, without changing the characteristics of the air diffusion pattern.

It consists of a double-flanged conical spiral in which the continuous blades are flexibly held in position and connected to the main cross bar by means of a threaded center rod. By turning the center rod knob, the blades may be shifted to any position from closed to wide open, providing variable adjustment of the effective area with resulting volume and throw changes, while the air diffusion pattern remains constant.

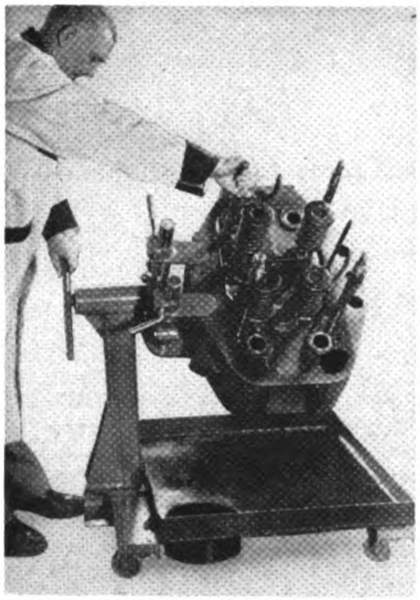
The Flexiflo is the only diffuser on the market that has an equalizing deflector as an integral part of the equipment. The


They wouldn't believe it either
—until they SAW it!
Seeing was believing for a group of mechanical officials from one of the mid-west's most prominent earth moving equipment builders.
Frankly they just wouldn't believe that the new 32" "AMERICAN" Pacemaker Lathe would effectively use 60 horse power and cemented carbide cutting tools in machining rough and tough alloy steel forgings. So they came to see for themselves and they saw:
1 Cuts $1\frac{3}{8}$" deep.
2 Cutting speed 300 feet per minute.
3 .030" feed.
4 60 horse power registered by horse power meter during the maximum cuts.
5 Not a shimmy or whimper from the machine.
They were amazed and convinced.
This new model Pacemaker is endowed with the power, stamina and convenience that combine to produce a thoroughly dependable and highly productive unit.
Bulletin No. 44 tells all . . . have one?
THE AMERICAN TOOL WORKS CO. Cincinnati, Ohio U.S.A.
LATHES AND RADIAL DRILLS

deflector vanes are individually movable and will remain fixed in any position.

These units are available in eleven sizes, the largest being capable of handling up to 9,000 cu. ft. per min. with a throw of over 48 ft.

◆



Diesel Engine Stand

It is well known that diesel engine heads are heavy and hard to work on. Without proper equipment, servicing is often awkward and slow.

Engine service shops in the railroad and power plant fields will be able to overcome this problem with the introduction of the All-Kleer Diesel Engine Stand, made by the R & G Manufacturing Co., Muncie, Ind.

This unit is different in that it engages the diesel heads from the side and does not block cleaning or other work on the manifold ends. The head is grasped in a non-jiggling grip by four adjustable engaging pins that fit into the head bolt holes and lock into place. Loosening or tightening of the pressure brake permits rotation of the engine head to practically any angle for most convenient and speedy servicing.

A sub-assembly adapter is available permitting the operator to service small diesel assemblies such as governors, fuel pumps, and similar items. Other features include heavy-duty rollers that permit moving the fully-loaded engine stand, a removable oil drip pan of approximately 10 gal. capacity, and a convenient tool pan.

The device measures only 34 in. high, 30 in. wide and 33 in. long, yet it handles weights and accessories up to 800 lb.

◆

Extra-Thin High Heat Insulation

To meet the demand for an extra-thin high heat insulation, Irvington Varnish & Insulator Company, Irvington, N. J., has introduced a new insulation of this type. This new product is known as Silicone Resin-Coated Novabestos. The insulation is only .003 in. thick, but it can be used at operating temperatures of 180 deg. C., which puts it in the category of Class H insulation. It is composed of 97 per cent pure asbestos and 3 per cent organic material. The long fiber construction of the base asbestos sheet also give it unusual physical properties for such a thin material.

◆

Diesel Engine Starting Fluid

Cold weather can cause serious disadvantages for the drivers of off-rail equipment. Now, according to the California Oil Co., Barber, N.J., that phase of winter automotive operation has been licked with the introduction of Chevron Starting Fluid. Nicknamed vitamin pills for engines, they are products of war necessities. Fixed amounts of the fluid are simply encased in gelatine capsules.

The production of these fluid-containing capsules is under the direction of the Gelatine Products Division, R. P. Shearer Corp., Detroit, Mich. It works with a priming system that is permanently connected to the intake manifold of the engines.

All the operator need do is to place a capsule in the tool, puncture it by pressing down the plunger and then prime the engine before he steps on the starter. The system has been designed with one to three injection nozzles so that it is adaptable to all internal combustion engine types and sizes.

◆

Megger Low Resistance Ohmmeter

The most recent addition to the Megger family of electrical resistance measuring instruments, made by James G. Biddle Co., Philadelphia, Pa., is a low-resistance ohmmeter designed for maximum convenience in field use. The set is self contained with a compartment for storing leads and hand spikes. It is supplied in two models, both having the same ranges of 0 to 1,000, and 0 to 10,000 microhms.

Model 1-R ohmmeter with built-in rectifier

Model 1-B is a battery-powered set which employs two Burgess 4 FH dry cells, or equivalent. Model 1-R has a built-in rectifier which can be plugged in to any ordinary lighting circuit outlet. The complete units, with batteries or rectifiers, weigh about 19 lb.

The ranges of the instrument cover a wide variety of applications, such as routine tests on circuit-breaker contacts, relays, switches, bonds, connections and joints, and bar-to-bar tests on commutator type armatures. The maker states that the ruggedness, compactness, and dependability of the set make it particularly applicable to power system and railroad use. No special training or experience is required for its operation.

◆

Self-Locking Bolt

A slotted-type "place" bolt, developed by the National Screw & Manufacturing Co., 2440 East 75th street, Cleveland 4, O., requires no nuts, washers or other devices to lock against vibration when drawn up against a rigid seat.

Cold-headed "Place" bolts are fully reusable, are in one-piece, and can be made of carbon as well as alloy steel. They are available in a range of American Standard sizes from ¼ to 1 in., in coarse or fine thread pitches.

The bolt's spring-action head not only establishes the locking action but also insures against fatigue, impact or shock failures. Upset slots across top of head divide it into six equal segments. Upset operation also forms a narrow circular recess under the head and next to the shank. The bearing area is the surface under the head and outside the recess. As the bolt is drawn up, the upward pressure on the bearing area slightly displaces the segments on top of the head, to effect the diaphragm spring action.

Grain flow is continuous through shank and head segments for maximum strength, and the shear section of the head is stronger than the mean equivalent area of the thread. The bolt as a result is capable of carrying a load equivalent to that of a conventional bolt or cap screw.

(New Devices continued on page 114)

NEWS

Mechanical Division To Meet in Frisco in 1952

THE next annual meeting of the Mechanical Division, Association of American Railroads, will be held at the Fairmont Hotel, San Francisco, June 24, 25 and 26.

Two-Wheel Hand Brake Inadequate for Diesels

A HAND BRAKE designed to operate upon only two wheels of an eight-wheel diesel-electric locomotive unit "is not an efficient hand brake," the Interstate Commerce Commission has declared. The declaration was embodied in the commission's report on an accident which occurred September 19 on the Seaboard Air Line at Raleigh, N.C. The report was No. 3428 and the investigation out of which it came was conducted by the commission's Bureau of Locomotive Inspection.

The accident was one in which a diesel-electric, running in "uncontrolled movement on a descending grade," collided with the rear end of a work train. It was caused by "inoperative air brakes and a defective hand brake" on the diesel, the commission found.

The hand brake involved was a two-wheel brake. The commission's recommendation was that the Seaboard "install and maintain efficient hand brakes upon its diesel-electric locomotives so located that they can be safely operated while the locomotives are in motion."

The locomotive involved in the collision was diesel unit No. 1714, a B-B type road switcher, which had a total weight of 234,620 lb. and a rated tractive force of 58,655 lb. It was powered by a 1,600-hp. engine and was mounted on two four-wheel trucks, each axle of which was gear connected to a traction motor.

The unit had No. 6-BL air-brake equipment. Its hand brake had a lever-type operating handle, and the hand-brake chain was connected to the right brake lever of the rear truck and "was effective on one pair of wheels only."

The collision occurred while a hostler was undertaking to move the diesel from one servicing track to another at the Seaboard's Raleigh enginehouse. The estimated speed of the locomotive at the time of the collision was 30 to 40 m.p.h. An improperly aligned switch was also involved.

The force of the collision drove the rear of the work train's caboose on top of the front platform of the diesel. The conductor and flagman on the work train were "seriously injured."

The diesel's air-brake equipment was slated for repairs at the time. An engineman, who had just completed a switching trick with it, had reported that the air brakes were "slow in applying and releasing." Evidence gathered by the commission's investigators indicated that, before the hostler undertook to move the unit, a machinist inspector had removed the plugs from the vent holes of the quick release valves of the air-brake apparatus. Thus, the "inoperative air brakes," which was one of the collision's causes.

To its conclusion that a two-wheel arrangement was "not an efficient hand brake," the commission, as indicated above, added a finding to the effect that the hand brake actually involved was also "defective." As to that, the report had this to say:

"The hand brake was tested and it was found that the pawl did not automatically engage the teeth on the ratchet on the upward or power stroke of the handle . . . It was found that the ¾-in. by 3-in. flat steel pawl spring was imbedded in road dirt and grit in the bottom of the operating lever housing. The dirt and grit were removed and all moving parts lubricated,

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of August 1951	Month of August 1950	8 months ended with August 1951	8 months ended with August 1950
3	Road locomotive miles (000) (M-211):				
3–05	Total steam	24,633	31,637	204,899	225,785
3–06	Total, Diesel-electric	23,960	18,842	175,186	134,198
3–07	Total, electric	810	881	6,539	6,527
3–04	Total, locomotive-miles	49,403	51,368	386,647	366,550
4	Car-miles (000,000) (M-211):				
4–03	Loaded, total	1,775	1,848	13,730	12,527
4–06	Empty, total	934	875	6,954	6,633
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6–01	Total in coal-burning steam locomotive trains	44,868	55,426	355,486	371,478
6–02	Total in oil-burning steam locomotive trains	12,267	14,508	96,991	98,825
6–03	Total in Diesel-electric locomotive trains	67,347	54,301	489,287	379,482
6–04	Total in electric locomotive trains	2,225	2,411	17,875	17,240
6–06	Total in all trains	126,716	126,687	959,749	867,208
10	Averages per train-mile (excluding light trains) (M-211):				
10–01	Locomotive-miles (principal and helper)	1.04	1.05	1.04	1.05
10–02	Loaded freight car-miles	40.00	40.30	39.40	38.20
10–03	Empty freight car-miles	21.00	19.10	20.00	20.20
10–04	Total freight car-miles (excluding caboose)	61.00	59.40	59.40	58.40
10–05	Gross ton-miles (excluding locomotive and tender)	2,842	2,765	2,757	2,645
10–06	Net ton-miles	1,351	1,297	1,292	1,999
12	Net ton-miles per loaded car-mile (M-211)	33.80	32.20	32.70	31.40
13	Car-mile ratios (M-211):				
13–03	Per cent loaded of total freight car-miles	65.50	67.90	66.40	65.40
14	Averages per train hour (M-211):				
14–01	Train miles	16.70	16.60	16.90	17.00
14–02	Gross ton-miles (excluding locomotive and tender)	47,101	47,349	46,047	44,264
14	Car-miles per freight car day (M-240):				
14–01	Serviceable	47.40	48.80	45.80	44.20
14–02	All	45.00	45.70	43.70	41.20
15	Average net ton-miles per freight car-day (000) (M-240)	997	998	950	845
17	Per cent of home cars of total freight cars on the line (M-240)	38.10	36.10	37.10	43.30
	PASSENGER SERVICE (DATA FROM I.C.C. M-213)				
3	Road motive-power miles (000):				
3–05	Steam	9,785	12,754	83,766	93,367
3–06	Diesel-electric	17,217	15,698	128,880	115,184
3–07	Electric	1,657	1,650	12,993	12,807
3–04	Total	28,659	30,102	225,639	221,358
4	Passenger-train car-miles (000):				
4–08	Total in all locomotive-propelled trains	283,996	295,207	2,192,681	2,129,042
4–09	Total in coal-burning steam locomotive trains	51,998	66,545	438,908	478,212
4–10	Total in oil-burning steam locomotive trains	33,181	44,208	267,812	293,967
4–11	Total in Diesel-electric locomotive trains	181,027	166,745	1,347,777	1,219,207
12	Total car-miles per train-miles	17,789	17,709	138,184	137,655
	YARD SERVICE (DATA FROM I.C.C. M-215)				
1	Freight yard switching locomotive-hours (000):				
1–01	Steam. coal-burning	1,148	1,533	9,896	11,232
1–02	Steam, oil-burning	238	284	1,915	1,907
1–03	Diesel-electric[1]	3,070	2,701	23,343	19,358
1–06	Total	4,482	4,549	35,360	32,710
2	Passenger yard switching hours (000):				
2–01	Steam, coal-burning	41	57	385	478
2–02	Steam, oil-burning	13	15	104	105
2–03	Diesel-electric[1]	249	237	1,932	1,803
2–06	Total	337	344	2,688	2,657
3	Hours per yard locomotive-day:				
3–01	Steam	7.6	8.9	7.8	7.8
3–02	Diesel-electric	17.2	17.9	17.3	17.3
3–05	Serviceable	14.5	14.9	14.4	1.30
3–06	All locomotives (serviceable, unserviceable and stored)	12.4	12.8	12,4	11.7
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.75	1.71	1.78	1.80
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.74	0.72	0.76	0.77

[1] Excludes B and trailing A units.

after which the handle and working parts were replaced. The brake could then be operated."

The report's summary of evidence said that the engineman, who operated the diesel on the switching trick just prior to the accident, had stated "that he used the hand brake during the dinner period and that he had to hold the dog with one hand while operating the handle with the other." Daily inspection reports on the locomotive were also in evidence. They included one made by an engineman on September 9 at Hermitage, Va.—"Hand brake broken."

24,200 Cars in N.P.A. First Quarter Program

FREIGHT cars programmed for production in the first quarter of 1952 total 24,200, the National Production Authority has announced. However, the announcement said, because of acute shortages of materials, allotments of controlled materials will be made to carbuilders on a basis of 21,200 cars.

Allocations will be made according to the following table:

	Total authorized	Total for which material will be granted
Tank cars	2,500	2,000
Domestic freight cars	20,500	18,000
Export cars (For Mexico)	1,200	1,200
Total	24,200	21,200

The new program determination authorized by the Defense Production Administration does not provide for any increase in allotments of steel, copper and aluminum to freight-car builders. These allocations, N.P.A. said, will still be based upon the original program determination.

"Although material allocations are not sufficient to build the larger number of units now authorized, it is believed that carbuilders will be able to build the larger number of units authorized now by using some materials from inventories and by conservation and substitution," Guy O. Beale, director of N.P.A.'s railroad equipment division, said. "The government fully recognizes the importance of a sound and healthy railroad transport system in the U. S. Program determinations on freight-car buildings are being made with this consideration in mind and are supported with controlled material allotments to the fullest extent possible in the present period of shortages."

Time for Compliance With New Diesel Brake Rule Set Back

THE Interstate Commerce Commission has set back, from January 1, 1952, until March 1, 1952, the date by which railroads must have fitted diesel-electric locomotives built prior to January 1, 1951, with equipment required by the modified air-brake rule of the commission's Rules and Instructions for Inspection and Testing of Locomotives Other Than Steam. The rule involved is Rule 205(a), and the modification was prescribed by a commis-

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE DECEMBER ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	No. of units	Horse-power	Service	Builder
Chesapeake & Ohio	81[1]	1,500	Freight	Electro-Motive
	21[1]	1,500	Freight and passenger	Electro-Motive
	10[1]	1,200	Switchers	Electro-Motive
	26[1]	1,600	Road switch	Alco-G. E.
	11[1]	1,600	Road switch	Baldwin-Westinghouse
Pennsylvania	8A[2]	1,500	Road freight	Electro-Motive
	4B[2]	1,500	Road freight	Electro-Motive
	13[2]	1,500	Road switch	Electro-Motive
	32[2]	1,200	Yard switch	Electro-Motive
	22A	2,250	Passenger	Electro-Motive
	13[2]	1,000	Yard switch	Alco-G. E.
	2[2]	1,000	Road switch	Alco-G. E.
	33[2]	1,600	Road switch	Alco-G. E.
	6[2]	1,600	Six-motor road switch	Alco-G. E.
	44[2]	1,200	Road switch	Baldwin-Westinghouse
	1[2]	1,200	Road switch	Baldwin-Westinghouse
	8[2]	2,400	Transfer	Baldwin-Westinghouse
	13[2]	1,200	Yard switch	Fairbanks, Morse
Reading	20	1,600	Road switch	Alco-G. E.
	10	1,600	Road switch	Baldwin-Westinghouse
	8	1,500	Road switch	Electro-Motive
	2A	1,500	Passenger	Electro-Motive

DIESEL-ELECTRIC LOCOMOTIVE INQUIRIES

Transportation Corps	772	1,600	
	20	1,200	

FREIGHT-CAR ORDERS

Road	No. of cars	Type of car	Builder
Atchison, Topeka & Santa Fe	30[3]	Refrigerator	Company shops
Gulf, Mobile & Ohio	200[4]	Pulpwood	Company shops
Minneapolis, St. Paul & Sault Ste Marie	50	70-ton ballast	American Car & Fdry.
Missouri-Kansas-Texas	25[5]	50-ton flat	Company shops
Pennsylvania	3,600[2]	Gondola	Company shops
	1,000[2]	Box	Company shops
	200[2]	Covered hopper	Company shops
	200[2]	Flat	Company shops
Wabash	200	50-ton box	American Car & Fdry.

FREIGHT-CAR INQUIRIES

Transportation Corps	1,646	40-ton gondola
	1,386	10,000-gal. tank
	135	Refrigerator
	2,000	40-ton box

PASSENGER-CAR ORDERS

Road	No. of cars	Type of car	Builder
Chicago & Eastern Illinois; Louisville & Nashville; Nashville, Chattanooga & St. Louis	29[6]	Sleeping	Pullman-Standard

PASSENGER-CAR INQUIRIES

Transportation Corps	89	Kitchen-troop hospital

[1] For delivery during the first half of 1952.

[2] Deliveries of the locomotives scheduled to begin next April. The cars are scheduled to be put into service beginning in April at a monthly rate of 200 to 400 cars, depending on steel allocations. Approximately $800,000 has also been appropriated for heavy repairs to existing freight cars.

[3] To be equipped with diesel-powered refrigeration systems provided by the Trance Company, the Frigidaire Division of General Motors, and the Carrier Corporation.

[4] To cost approximately $1,125,000.

[5] Construction tentatively scheduled for early 1952, at a cost of approximately $200,000.

[6] This order calls for 29 identical combination bedroom, roomette and open section cars costing $163,000 each—or a total of $4,727,000. Delivery is contemplated for the first quarter of 1953. The cars, to be of lightweight construction ,will contain four bedrooms, six roomettes and four open sections. Both the bedrooms and roomettes will have circulating ice water and individual air-conditioning controls. The bedrooms will be arranged for occupation *en suite* if desired. The cars will be used flexibly between the roads' joint services as conditions warrant.

NOTE:

Chicago, Rock Island & Pacific.—The board of directors of the Rock Island has authorized the purchase of 27 800-hp. switching and 25 1,500-hp. road-switching diesel-electric locomotive units.

SUMMARY OF MONTHLY HOT BOX REPORTS

Month	Foreign and system freight car mileage (total)	Cars set off between division terminals account hot boxes: System	Foreign	Total	Miles per hot box car set off between division terminals
July, 1950	2,745,932,894	....	.....	23,957	114,619
August, 1950	2,937,455,020	7,422	15,490	22,912	128,206
September, 1950	2,974,297,739	6,541	12,881	19,422	153,141
October, 1950	3,165,997,915	4,343	8,935	13,278	238,439
November, 1950	2,868,871,913	2,536	5,331	7,867	364,672
December, 1950	2,813,042,212	2,278	5,968	8,246	341,140
January, 1951	2,840,847,511	2,870	8,436	11,306	251,269
February, 1951	2,425,226,454	4,528	14,063	18,591	130,452
March, 1951	3,063,173,942	3,667	10,078	13,745	222,857
April, 1951	2,996,562,763	3,702	8,914	12,616	237,521
May, 1951	3,013,634,782	5,631	13,737	19,368	155,599
June, 1951	2,874,873,495	7,074	15,376	22,450	128,057
July, 1951	2,768,920,095	8,886	18,823	27,709	99,929
August, 1951	3,009,371,111	9,023	19,092	28,115	107,038

sion order of January 29, 1951, in a proceeding docketed as Ex Parte 174. (See page 90, March, 1951, *Railway Mechanical and Electrical Engineer.*)

Bryant Chairman A.S.M.E. Railroad Division for 1952

C. B. BRYANT, chief engineer, Technical Board, Wrought Steel Wheel Industry, is chairman of the Railroad Division, American Society of Mechanical Engineers, to serve until the close of the annual meeting of the society in 1952. Mr. Bryant succeeds C. E. Pond, assistant to superintendent motive power, Norfolk & Western, who served as chairman during 1951. Other members of the Executive Committee for the coming year are D. W. Bohannon, manager purchases and stores, Pullman Company; E. M. VanWinkle, vice-president, American Steel Foundries; C. K. Steins, mechanical engineer, Pennsylvania, and J. S. Newton, vice-president, Baldwin-Lima-Hamilton Corporation. E. L. Woodward, western mechanical editor, Railway Age, is secretary.

New members on the General Committee of the Railroad Division with five-year terms expiring in 1956, include M. M. Cooledge, eastern sales representative, Buckeye Steel Castings Company; J. W. Hawthorne, general superintendent motive power and car equipment, Atlantic Coast Line, and J. F. Weiffenbach, vice-president in charge of manufacturing, Canadian Locomotive Company, Ltd. E. H. Davidson, director, Bureau of Locomotive Inspection, Interstate Commerce Commission, whose term on the General Committee expired this year, continues on the committee for a second term.

The terms of the new officers and committee members began at the close of the final Railroad session at the annual meeting of the Society held at Atlantic City, November 26-29.

A. A. R., Mechanical Division

INTERCHANGE RULES ON FLOOD DAMAGE CLARIFIED

In a circular letter dated November 19, the A. A. R. Mechanical Division reports that damage to a large number of freight cars partially or totally submerged during floods in the midwest last summer caused many questions regarding responsibility, settlements, etc., which have been studied by the Arbitration Committee and the following interpretations approved:

"Sec. (10) (1) of Rule 32 and Par. (12) Sec. (a) of Passenger Car Rule 8 include damage to any part of the car; C. O. T. & S. or air brakes together with the work to be performed as outlined in Sec. V Supplement 1 of Instruction leaflet No. 2391 when brakes have been submerged; repacking of journal boxes and all other work performed as specified in the Lubrication Manual; rusted or pitted journals; cleaning inside and outside of car and parts thereof of silt, mud, grease, tars, acids, etc.; painting where necessary; renewal of sheathing, lining, flooring or ceiling, due to warped, split or contaminated condition; and including insulation which has been contaminated or otherwise damaged.

"If a car with flood damage concealed in ordinary inspection and without flood damage defect card attached is found to have been partly or totally submerged in flood, the 90-day limit for procuring joint inspection under Sec. (k) and Interpretation 3 of Rule 4 is considered as beginning upon first receipt of car home after responsibility is acknowledged by damaging line that car was in flood."

CAST STEEL TO BE TESTED IN FREIGHT SERVICE

The General Committee of the division, in a meeting at Chicago on November 16, approved the recommendations of the Committee on Wheels that authority be granted to manufacture and place in service under interchange freight cars up to 1,000 experimental cast steel wheels with carbon content of 1.50 per cent and up to 1,000 wheels with carbon content of 0.75 per cent.

SUPPLY TRADE NOTES

BALDWIN-LIMA-HAMILTON CORPORATION. —the Baldwin-Lima-Hamilton Corporation has transferred its Washington district office from 616 Tower building to 642 Wyatt building, 14th and New York avenue, N.W., Washington 5.

John S. Newton, vice-president of the corporation at Eddystone, Pa., has been assigned complete responsibility for the Locomotive division, including locomotives, renewal parts and other related equipment.

◆

JOURNAL BOX SERVICING CORPORATION.—*Thomas I. Conway* has been appointed supervisor of service of the Journal Box Servicing Corporation of Indianapolis, with headquarters in Chattanooga, Tenn.

Mr. Conway has spent a number of years in various experimental and research capacities for the company, and has been plant foreman at a number of plants throughout the country. In 1935 he was appointed western supervisor, at Pocatello, Idaho. In 1939, he was appointed service engineer on the Southern, with headquarters at Chatanooga.

◆

CUMMINS ENGINE COMPANY.—*R. F. Davis*, formerly assistant regional manager, Central region, of the Cummins Engine Company, at Chicago, has been promoted to regional manager, Eastern region, with headquarters at New York. Mr. Davis succeeds *Walter N. Westland*, who has been appointed head of Cummins Diesel of New England, Inc., with headquarters at Allston, Mass. *W. G. Turner*, regional manager of the southeastern region at Atlanta, Ga., has been transferred to Cleveland as regional manager, Great Lakes region.

◆

PITTSBURGH PLATE GLASS COMPANY.—The Pittsburgh Plate Glass Company will enter the fiber glass production field in the near future and formation of a separate development and production unit—the Fiber Glass Division—is now in process. *J. Hervey Sherts* will head the new division as general manager.

◆

TIMKEN ROLLER BEARING COMPANY.—*Robert E. Cook*, formerly field engineer with the Timken Roller Bearing Company at Cleveland, has been appointed sales engineer of the steel and tube division of the Cleveland office.

◆

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY.—Minneapolis-Honeywell has opened a new district office at Harrisburg, Pa., in the Kline Village development. *William J. Brosch* and *Jack Caylor* will handle sales for the companys Brown Instruments division; *John Hopkins* will handle commercial, and *Donald Schmick*, heating controls divisions sales.

STANDARD CAR TRUCK COMPANY.—*Ben H. Leese* has been appointed service manager of the Standard Car Truck Company. He will supervise an augmented service staff to care for and instruct railroad personnel in the field servicing of Barber stabilized trucks.

Mr. Leese, formerly on the engineering staff of the Locomotive Firebox Company, became associated with the Standard Car Truck Company in 1949, as draftsman and inspector. He was born on May 14, 1903, in Davenport, Iowa.

◆

SUPERHEATER COMPANY.—*H. G. Harrison*, formerly assistant to the manager of service of the *Superheater Company*, division of *Combustion Engineering-Superheater, Inc.*, has been appointed manager of service, with headquarters at East Chicago, Ind., and *F. C. Widmayer*, formerly service representative, has been appointed assistant manager of service, also of East Chicago.

◆

FAFNIR BEARING COMPANY.—*Henry Hubbell* of the Fafnir Bearing Company, New Britain, Conn., was one of the prize winners in a casting design contest conducted by the *Meehanite Metal Corporation*, New Rochelle, N. Y., opened to design engineers in manufacturing plants using castings, aimed toward uncovering facts toward new uses and applications of Meehanite cast-

3 dollar-saving reasons why it pays to specify

Adlake Sectional Diaphragms

Longer life . . . Top and legs are *separate units*. This gives maximum flexibility and prevents pulling apart of the belting (which usually occurs first at corners). Adds years to the life of the diaphragm.

Economy . . . Since top and legs are independent, any damaged section can be replaced without installing a whole new unit.

Self-cleaning construction . . . Sloping top permits quick drainage, so dirt, cinders, snow, etc., can *not* accumulate to hold moisture.

Yes, ADLAKE Sectional Diaphragms save you money by giving trouble-free, low-cost service for extra years. Get the full story on ADLAKE's efficient economy today . . . drop a card to 1110 N. Michigan, Elkhart, Indiana. No obligation, of course.

Adlake TRADE MARK

THE Adams & Westlake COMPANY

Established 1857 ELKHART, INDIANA New York • Chicago

Manufacturers of ADLAKE Specialties and Equipment for the Railway Industry

ings and uncovering problems solved by their specifications. For his paper on "Railway Journal Housing," Mr. Hubbell won the fourth of six prizes offered by the Meehanite company.

◆

DETREX CORPORATION.—*W. H. Webb* has been appointed sales manager of alkali products for the Detrex Corporation of Detroit. Since he jointed Detrex 10

W. H. Webb

years ago, Mr. Webb has worked successively as assistant manager Alkali division, assistant national accounts manager and central region manager.

◆

AMERICAN BRAKE SHOE COMPANY.—*William M. Black* has been appointed president, and *Joseph L. Mullin* vice-president, of the Electro-Alloys division, American Brake Shoe Company. *Walter G. Hoffman*, former president of the division, has been appointed assistant to the vice-president for research and development of American Brake Shoe.

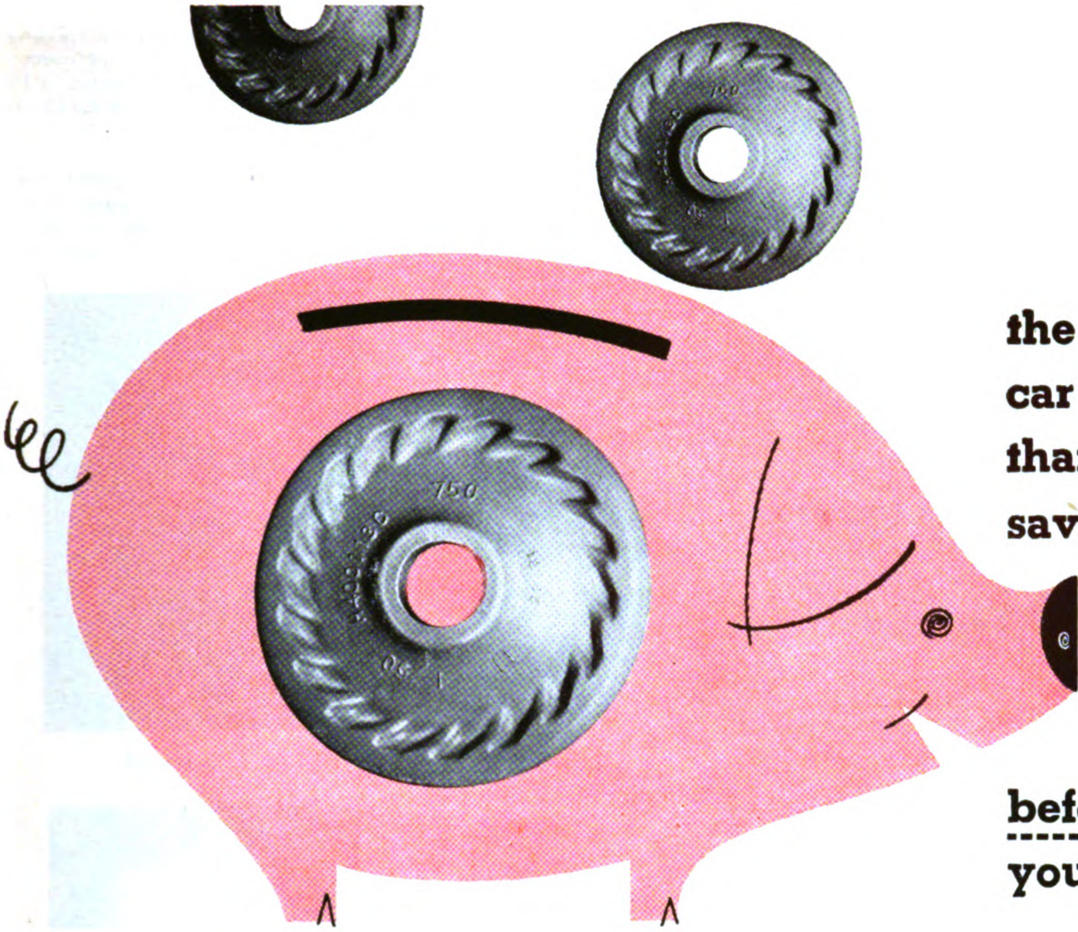
Mr. Black is a vice-president of American Brake Shoe and also president of the American Manganese Steel division since

William M. Black

1940. He joined the company as an apprentice in 1912 and worked in both operating and sales departments.

Mr. Mullin, who joined the company in 1914, is vice-president in charge of operations for the American Manganese Steel division and will continue in that capacity.

Mr. Hoffman will be assigned to special metallurgical development projects at the



the car wheel that starts saving money

before you buy it!

The railroad that runs its freight cars on AMCCW wheels literally saves money on every wheel it buys—before it buys it! Reason is that reliable, prompt, short-haul delivery schedules permit a *minimum* inventory. You don't have to order this wheel months ahead, or tie up capital to maintain a big stockpile. You *know* you can get the wheels you want from the AMCCW plant on or near your line . . . in a matter of weeks, if not days.

A smaller car wheel inventory is just as good as money in the bank. *Better* if you can put it to more profitable use.

But that's only the *START*. . .

Once the wheel is delivered, you save again, in the Wheel Shop. Boring is faster, easier on cutting tools. The gray iron hub greatly reduces the pressures required for mounting. And when they are mounted, AMCCW wheels stay put.

Quick, low-cost delivery of chilled car wheels from the AMCCW plant near you.

With the new heavier-tread, thicker-bracketed chilled wheels under your cars, you save again, in terms of increased ton-miles of service.

Even after an AMCCW wheel has lived its long life, the savings continue. Short hauls to the nearest AMCCW foundry, low exchange costs for new wheels, combine to keep replacement wheel costs to the very minimum.

In good supply
Available locally
Short-haul delivery
Reduced inventory
Low first cost
Low exchange cost
Increased ton mileage
High safety standards
AMCCW plant inspection
Easier shop handling

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

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AMCCW

American Car & Foundry Co. • Southern Wheel (American Brake Shoe Co.)
Griffin Wheel Co. • Marshall Car Wheel & Foundry Co.
New York Car Wheel Co. • Pullman-Standard Car Mfg. Co.

company's research center in Mahwah, N. J. He joined the sales department of American Manganese steel division in 1930 and was appointed president of the Electro-Alloys division in 1943.

◆

National Steel Car Corporation.—*A. P. Shearwood* has been appointed vice-president in charge of sales of the National Steel Car Corporation and *H. J.*

A. P. Shearwood

H. J. Lang

Lang, acting assistant to the president, has been appointed a vice-president. Messrs. Shearwood and Lang, both graduates in engineering of McGill University, joined National Steel Car in 1932 and 1945, respectively.

◆

General Electric Company.—*Glenn B. Warren,* general manager, Turbine Divisions, General Electric Company, Schenectady, N. Y., during the recent A.S.M.E. annual meeting at Atlantic City, was awarded the A.S.M.E. medal for "leadership in the science and art of turbine design." J. Kenneth Salisbury, division engineer, general engineering and consulting laboratory, received the Richards Memorial Award for "outstanding achievement in mechanical engineering within 20 to 25 years after graduation."

◆

Eutectic Welding Alloys Corporation.—A wing to house two new research laboratories has been completed by Eutectic Welding Alloys Corporation, Flushing, N. Y. The new building, it is said, will

Exide-Ironclad
BATTERIES

ARE YOUR BEST POWER BUY— AT ANY PRICE

They ASSURE high maneuverability of trucks . . . rapid, accurate handling of material. PROVIDE uniform rate of material handling with no unscheduled down time. SHOW lowest costs of operation, maintenance, repair, depreciation . . . inherently safe. For all types, sizes, makes of battery-electric trucks—hand or rider. Call in an Exide representative, and let him prove these facts.

THE ELECTRIC STORAGE BATTERY COMPANY
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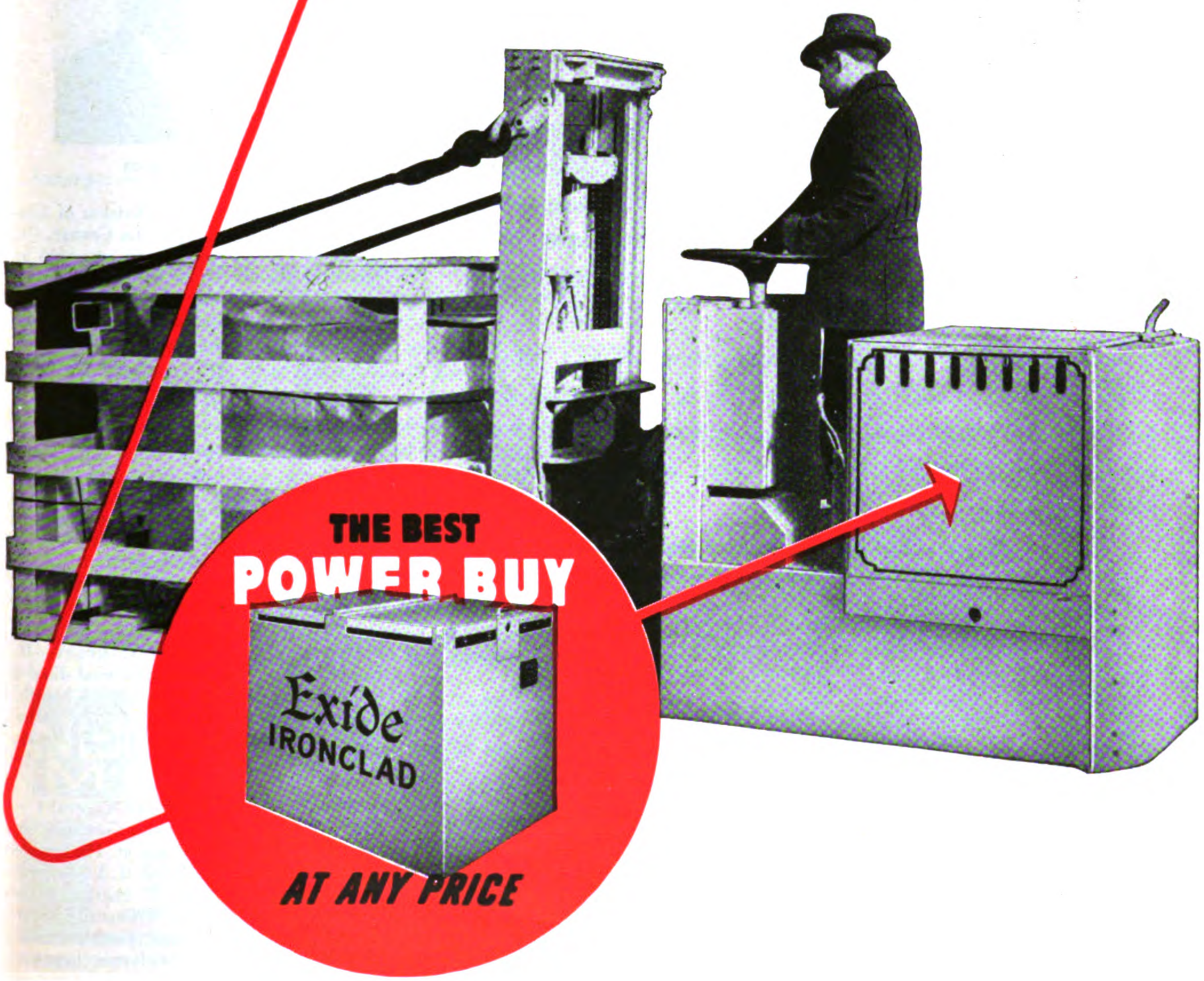
"Exide-Ironclad" *Reg. Trade-mark U. S. Pat. Off*



contain a special staff of research chemists and physicists who will concentrate on the development of new welding alloys utilizing fewer critical short metals. Research on new metals, such as titanium joining, is also included among the projects scheduled for this group.

◆

CANADIAN LOCOMOTIVE COMPANY.—*J. F. Weiffenbach,* works manager of the Canadian Locomotive Company of Kingston, Ont., has been appointed vice-president in charge of manufacturing of the Company, to succeed *J. J. Jarrell,* who has retired after 45 years with the firm. In his new position, Mr. Weiffenbach will direct manufacture of diesel-electric locomotives and engines, as well as a wide range of industrial equipment.

Mr. Weiffenbach is a graduate of the University of Michigan (1934) with a degree in mechanical engineering. He later

J. F. Weiffenbach

joined the Electro-Motive Division of General Motors Corporation at La Grange, Ill., where he worked for 12 years. In 1946 he joined Fairbanks, Morse & Co. in Chicago, and subsequently was appointed chief engineer of its diesel locomotive division, and later manager of engineering at its Beloit, Wis., plant. In April 1951 Mr. Weiffenbach was appointed works manager of Canadian Locomotive at the Kingston, Ont., plant, the position he held at the time of his recent promotion.

◆

QUAKER RUBBER CORPORATION.—*J. J. Merkel* and *E. E. Klemm* have been appointed branch managers of the Detroit and Cleveland districts, respectively, of the *Quaker Rubber Corporation,* division of the *H. K. Porter Company.*

◆

UNITED STATES RUBBER COMPANY.—*H. Barden Allison* has been appointed district sales manager of the Philadelphia branch, mechanical goods division, *United States Rubber Company,* to succeed *A. B. Means,* who will continue as sales advisor.

◆

GEORGIA-PACIFIC PLYWOOD COMPANY.—The Georgia-Pacific Plywood Company has opened a new warehouse at Harborside Industrial Park, Providence, R. I. *Bernard V. Longerman* will be in charge, under supervision of district manager *Charles Levesque.* The company also has completed an extensive warehouse improve-

How many railroads own this train?

As high as 83% of operated cars are foreign — another reason why railroads standardize on SOLID JOURNAL BEARINGS.

A recent study of 6 roads—picked at random—proved that out of every 100 freight cars operated, *from 55% to 83% were foreign!* Think of the resulting interchange problem. Service and maintenance require a tremendous degree of standardization when 8 out of 10 cars belong to other roads. *Free interchange is another basic reason why railroads have so completely standardized on the Solid Journal Bearing . . . for simple, fast, economical maintenance and inspection.* Performance? The performance records of Solid Journal Bearings speak for themselves—with as high as 6½ *Million bearing miles per car set-out!* These performance records are unequalled—and they're constantly being improved. Year after year shows a steady increase in speeds, loading and daily car mileage. That's why railroads will continue to find the answer to dependability, ease of maintenance, operating economy and free interchange in the Solid Journal Bearing.

THESE ARE THE SERVICE-PROVED FACTS ABOUT SOLID JOURNAL BEARINGS

Easiest to Maintain — replacement takes minutes, without need for skilled labor.

More Simple Design — the only answer to unrestricted interchange.

Lowest Cost — save over 25% on car cost; average only $20 per car set in replacement.

Smoothest Ride — lateral movement is not rigidly opposed.

Most Liberal Tolerances—Axles can be used and re-used with simple roller burnishing.

Lowest Running Friction — a single film of oil permits faster acceleration, lower running resistance — particularly at low temperatures.

Lightest Weight — up to 60% less dead weight than any other type of bearing.

NBM

National Bearing Division . . . Serving America's Railroads since 1874 with a complete line of Journal Bearings, Engine Bearings and Bronze Parts.

AMERICAN **Brake Shoe** COMPANY

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PLANTS IN: ST. LOUIS, MO. • MEADVILLE, PA. • NILES, OHIO • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.

ment and expansion program at Port Newark, N. J., including a new office building on Marsh street, to house eastern division offices and Port Newark warehouse offices.

◆

American Air Filter Company of Canada.—The Canadian business of the American Air Filter Company, Louisville, Ky., will be handled by *American Air Filter of Canada,* Montreal. *William G. Hole,* formerly of Darling Bros., Ltd., will be in charge of all Canadian operations.

◆

Simmons-Boardman Publishing Corporation.—*William E. Russell, Jr.,* of the New York law firm of Russell & Russell, has been elected a member of the board of directors of the Simmons-Boardman Publishing Corporation, publishers of the

William E. Russell, Jr.

Railway Mechanical and Electrical Engineer and other publications in the transportation and building industries. Mr. Russell takes the place on the directorate formerly occupied by the late Mrs. Ida R. Simmons, who was principal stockholder in the publishing company. His father, senior member of the Russell & Russell

John S. Vreeland

firm, has been on the directorate of the publishing company for many years and is trustee under the will of the late Mrs. Simmons of the controlling stock interest in the publishing company. The Russell firm has for many years handled the legal

(*Continued on page 106*)

GREASE TIMKEN® BEARINGS AT ONE WHEEL-TURNING; FORGET 'EM TILL THE NEXT!

Operating tests on passenger trains in regular service now prove that grease-lubricated Timken® bearings can safely go from wheel-turning to wheel-turning without attention! In fact, in one of the tests, grease-lubricated Timken bearings ran more than 200,000 miles without lubricant being added.

BIG SAVINGS FOR THE RAILROADS

As a result of these tests, the way is now open for important new railroad operating economies on Timken bearing equipped passenger cars and diesels. The man-hours previously needed for checking and addition of lubricant between wheel-turnings can be eliminated. And there is also a saving on the lubricant itself.

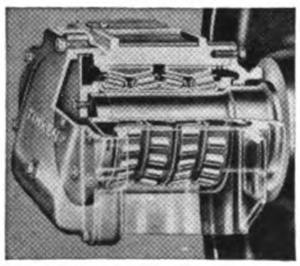
SWITCH TO GREASE NOW UNDERWAY

Already, three leading railroads have made the switch from oil to grease in their Timken bearing equipped passenger cars. More than a dozen other roads are now testing wheel-turning to wheel-turning lubrication with grease-lubricated Timken bearings, with favorable results.

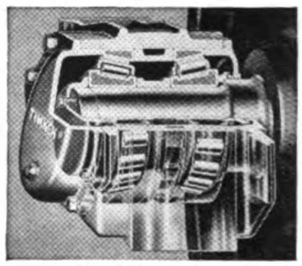
CONVERSION NO PROBLEM

Timken bearings can be converted from oil lubrication to grease without modifying the bearings or buying extra journal parts. And operating tests show that Timken bearings are the *only* railroad journal bearings which can consistently go a full wheel-turning period on AAR-approved grease, with no addition of lubricant.

We will be glad to help you investigate the cost-saving advantages of grease lubrication of Timken bearings on *your* railroad. Write The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



Typical Timken roller bearing application for passenger cars.



Typical Timken roller bearing application for diesel locomotives.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

THE ONLY RAILROAD JOURNAL BEARINGS THAT CONSISTENTLY GO FROM WHEEL-TURNING TO WHEEL-TURNING ON AAR-APPROVED GREASE!

NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

(Continued from page 102)

affairs of the publishing company. *John S. Vreeland* has been elected a vice-president of the corporation. Mr. Vreeland, a sales representative for the Simmons-Boardman railroad publications since June 1946, was formerly eastern engineering editor of *Railway Age* and eastern editor of *Railway Engineering and Maintenance.*

◆

Preco, Inc.—Preco, Inc., Los Angeles, Calif., has announced that *Electra Motors,* Anaheim, Cal., has been selected to develop and supply small electric motors and accessory equipment for use with Preco fans in refrigerator car installations.

◆

Aluminum Company of America. — Thomas D. Jolly, vice-president in charge of engineering and purchases for the Aluminum Company, has received the Merit Award of the Carnegie Institute of Technology "in recognition of his achievement in engineering and management in the aluminum industry, which has brought great credit to him and to his Alma Mater."

Obituary

Joseph A. Brownell, formerly assistant manager of railway sales for the Texas Company in New York, died on November 24. He was 66 years old.

L. L. King, Denver sales representative of the Okonite Company, died on November 2. He had been with Okonite since 1930.

Albert C. Sensenney, division manager of the railway sales department of the Lehon Company, died on November 21 in Chicago. He was 62 years old.

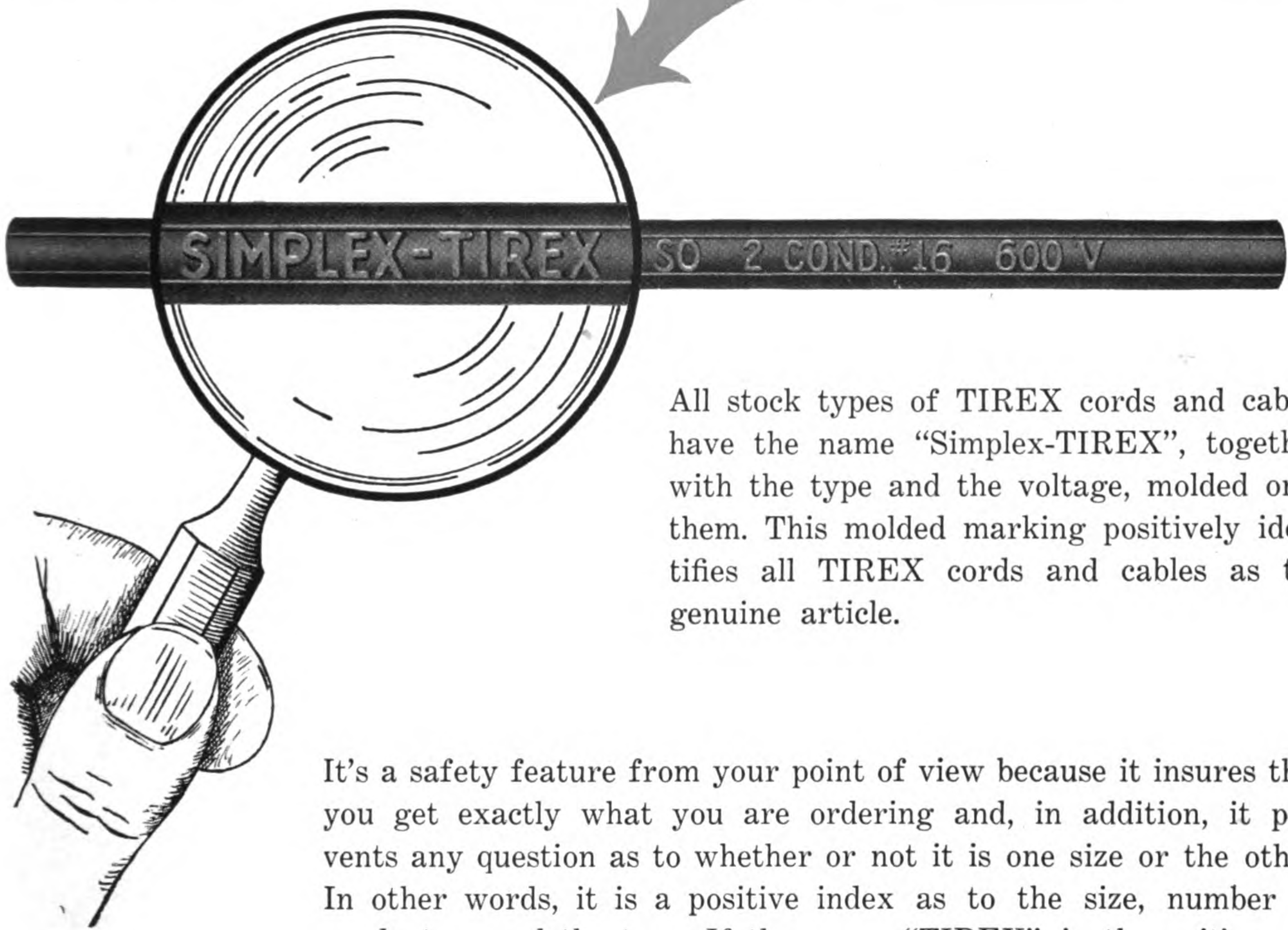
William T. Bissell, vice-president and general manager of the Journal Box Servicing Corporation at Indianapolis, died on October 8. Mr. Bissell started his railroad career in 1902 as oil-house man for the St. Louis-San Francisco at Springfield, Mo., and advanced until he became traveling storekeeper. In 1913 he went to the Chicago & Eastern Illionis at Danville, Ill., as general storekeeper. He started with the Journal Box Servicing Corporation in 1928 as service engineer, and several years later became general manager and still later vice-president and general manager.

PERSONAL MENTION

General

A. H. E. Parkes, assistant superintendent and master mechanic of the Canadian National at Prince George, B. C., has been appointed superintendent of motive power and car equipment for the Saskatchewan district at Saskatoon, Sask. Mr. Parkes in 1916 became a call boy in the employ of the company at Winnipeg. He held various positions in the Manitoba district until 1929, when he became locomotive foreman

THIS IS THE MARK OF *Quality*



All stock types of TIREX cords and cables have the name "Simplex-TIREX", together with the type and the voltage, molded onto them. This molded marking positively identifies all TIREX cords and cables as the genuine article.

It's a safety feature from your point of view because it insures that you get exactly what you are ordering and, in addition, it prevents any question as to whether or not it is one size or the other. In other words, it is a positive index as to the size, number of conductors and the type. If the name "TIREX" is there it's your assurance that you are getting genuine Selenium Neoprene Armored TIREX.

The next time you need portable cords or cables be sure you specify TIREX and then be sure you get it by insisting that the cord or cable you get is marked "Simplex-TIREX".

TIREX SELENIUM Neoprene Armor

SIMPLEX-TIREX IS A PRODUCT OF SIMPLEX RESEARCH

SIMPLEX-TIREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

at Swan River, Man. In 1939 he was named shop foreman at Fort Rouge, Man., and in 1941 was transferred to Calgary, Alta., as acting master mechanic. He was appointed master mechanic there in 1942, and master mechanic at Edmonton, Alta., in 1943. In 1948 he was appointed assistant superintendent and master mechanic at Prince George.

W. C. Bowra, general superintendent motive power and car equipment of the Grand Trunk Western at Battle Creek, Mich., has been appointed general superintendent motive power and car equipment of the Central Region of the Canadian National at Toronto.

Gordon T. Wilson, assistant engineer car equipment of the New York Central System at New York, has been appointed engineer car equipment. Mr. Wilson was born at Middletown, N. Y., on December 25, 1896. He received an electrical engineering degree from Syracuse University in 1921 and was a helper apprentice on the New York, Ontario & Western during summer vacations from 1912 until 1920, except while he was in the U. S. Navy from June 1917 until February 1919. Mr. Wilson was in the engineering department of the Niagara Hudson Power Company, Buffalo, from June 15, 1921, until February 1, 1923. On that date he became special engineer

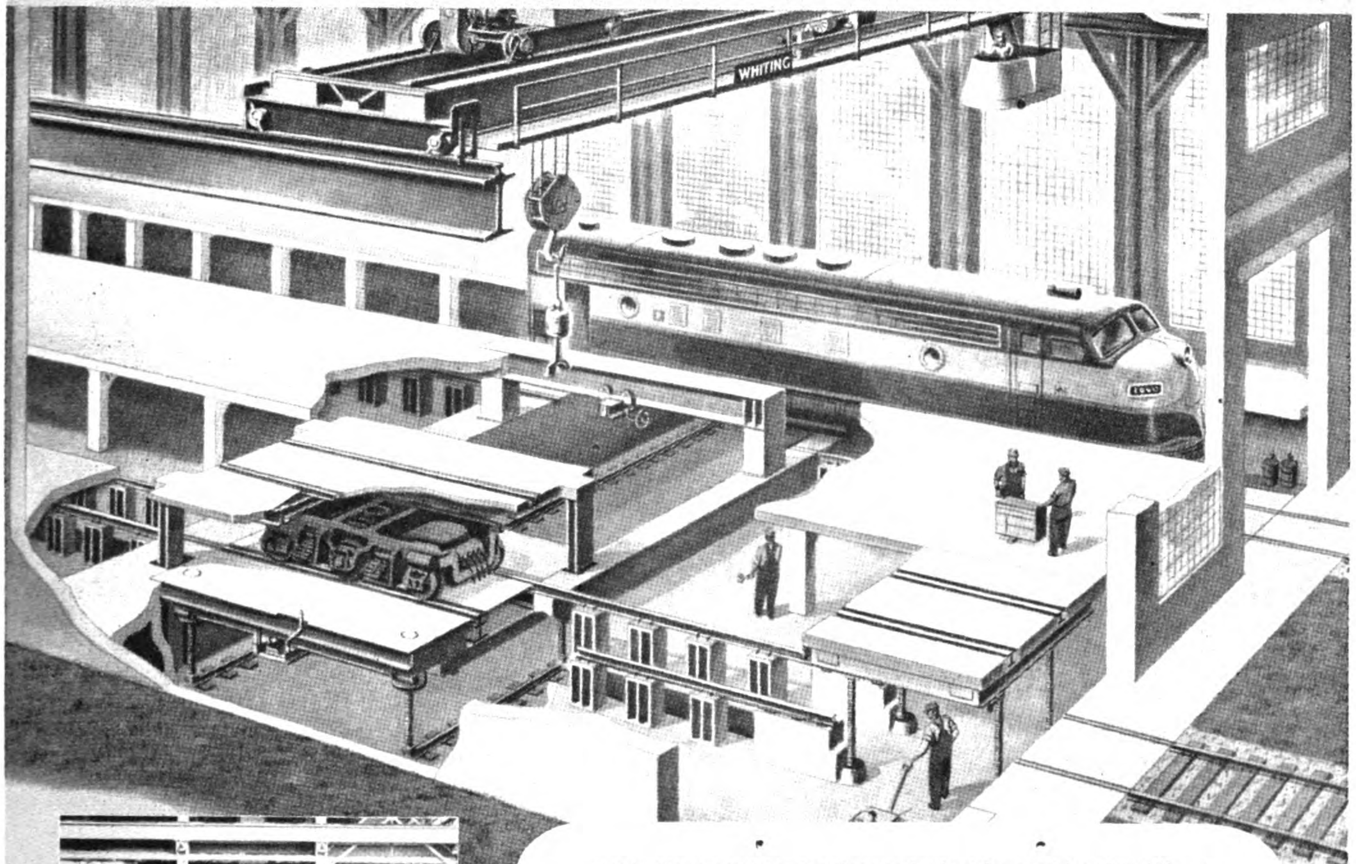
G. T. Wilson

motive power, on the New York Central at Buffalo. On January 2, 1925, he was appointed shop and equipment inspector, test department, for the N. Y. C. System at Buffalo. On January 15, 1926, he became general inspector, test department, at New York; on May 15, 1927, general equipment inspector motive power (assistant to chief engineer), at New York; on March 15, 1936, general equipment inspector (locomotives); on March 15, 1937, automotive engineer, and on November 1, 1945, assistant engineer car equipment, System, at New York. Mr. Wilson is a member of the Air Conditioning Committee of the A.A.R. Mechanical Division. He is a licensed professional engineer in New York State.

Orris L. Dean, chief engineer of the Bangor & Aroostock at Houlton, Me., has retired on account of ill health, after 38 years of service. Mr. Dean was born at Medford, Me., on December 2, 1890, and served as sectionman on the B.&A. at

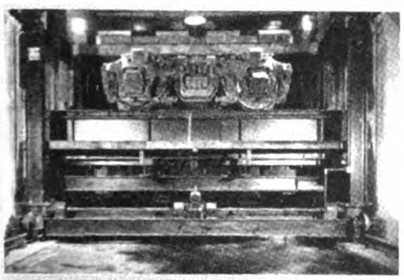
THE MODERN SHOP is a WHITING SHOP

Shrinks Lay-up Time for More Operating Profits



Note: Whiting Drop Table, Body Supports, Overhead Crane, and Cross-Over Bridge

Whiting Drop Table in Wabash Shops at Decatur, Ill., where a steam shop has been remodeled into a Diesel shop.



Truck dropped into pit for sidewise transfer on Whiting Drop Table. Electrical control from outside of pit. Central Railroad of N. J.

For a quick, efficient truck change, spot the locomotive onto the Whiting Drop Table—drop the old truck unit—move to nearby service track. Roll on a stand-by unit and move back to locomotive. Then in a short time the locomotive is ready to go back on the line.

Whiting Drop Tables are specially designed to help reduce lay-up time. Your motive power can gain hours of valuable working time, add many dollars to your revenue, by using this modern moneysaving equipment.

Available in a variety of styles and sizes, Whiting Drop Tables will speed the job of dropping wheels or complete trucks on either Diesel-electric or steam locomotives, tenders, and coaches. Write for New Bulletin DT-C-404, today.

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RAILROAD MAINTENANCE EQUIPMENT

Offices in Chicago, Cincinnati, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, and St. Louis. Representatives in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario. Export Department: 30 Church Street, New York 7, N. Y.

Derby, Me., during the summer of 1909 and from June 1910 until February 1911. Since September 1914 he has been in the continuous service of that road succeeding, as machinist helper, machinist, erecting foreman, acting general foreman, general inspector motive power, shop superintendent, acting mechanical superintendent, mechanical superintendent, superintendent shops and mechanical superintendent.

Charles H. Lockhart, mechanical inspector of the Canadian National at Montreal,, has been appointed superintendent of motive power and car equipment of the Central Vermont at St. Albans, Vt. Mr. Lockhart began his railroad career as a machinist apprentice 41 years ago and subsequently served as machinist, draftsman and mechanical inspector. During the war his services were loaned to the Canadian government in the auto and tank production branch of the Department of Munitions and Supply. Mr. Lockhart has looked after all details in connection with building new locomotives at the Montreal Locomotive Works and the Canadian Locomotive Company at Kingston, Ont.

New York Central.—The Equipment Department, Line East, of the New York Central has been reorganized as follows:

F. E. Edwards, master mechanic at Harmon, N. Y., now has jurisdiction over the locomotive department on Hudson, Harlem and Putnam divisions. Mr. Edwards, as formerly, has jurisdiction also over locomotive and multiple unit equipment on Electric division.

R. J. Parsons, master mechanic at Albany, N. Y., now has jurisdiction over both locomotive and car departments on the Mohawk, River and Adirondack divisions.

E. L. Hyatt, master mechanic of the Boston & Albany at Boston, Mass., now has jurisdiction over locomotive and car department facilities at Hudson, N. Y., previously under the jurisdiction of Mr. Parsons.

G. A. Miller, division general car foreman at Mott Haven, N. Y., now has jurisdiction over car department, Electric, Hudson, Harlem and Putnam divisions.

Edwin P. Moses, engineer car equipment, New York Central System, has retired. Mr. Moses was born on May 13, 1884, at Croton Falls, N. Y. He attended high school for three years and in 1902 became a draftsman for the Neptune Meter Company, Long Island City, N. Y. Later in the same year he became a draftwsman for the Pan-American Motor Company, Mamaroneck, N. Y., and Marion, N. J. In March 1903 he entered the employ of the Western Electric Company as a draftsman and checker. His association with the New York Central began in 1905 as a draftsman at New York. In 1909 he was appointed draftsman foreman; in 1911, chief car draftsman; and in 1918, general car inspector. From March until

E. P. Moses

September, 1921, he was foreman construction inspector, and then general inspector until 1923. He was appointed chief equipment inspector in 1923; assistant engineer rolling stock in 1924; general equipment inspector in 1925; engineer rolling stock, N.Y.C. System, in 1926, and engineer car equipment on January 1, 1949. Mr. Moses was a member of the Car Construction Committee of the A.A.R. Mechanical Division from 1941 until 1946. At the time of his retirement he was chairman of the Mechanical Division Committee on Geared Hand Brakes, of which he became a member in 1942, and chairman of the Joint Committee on Railway Sanitation which began its research project on January 1, 1946. He is a member of the

American Society of Mechanical Engineers and of the New York Railroad Club.

ARTHUR SELBEE, superintendent of motive power and car equipment of the Central Vermont at St. Albans, Vt., has been appointed general superintendent, motive power and car equipment of the Grand Trunk Western at Battle Creek, Mich.

IRVING C. BLODGETT, supervisor of schedules of the Boston & Maine, has retired after more than 50 years of service. He was assistant to the mechanical superintendent from 1926 to April 1927.

W. C. SEALY, general superintendent motive power and car equipment of the Central Region of the Canadian National at Toronto, has retired.

A. O. SCOTT, master mechanic of the Canadian National at Port Arthur, Ont., has been appointed regional locomotive fuel supervisor at the same Port Arthur.

W. J. STROUT, chief engineer of the Bangor & Aroostock at Houlton, Me., has been appointed acting mechanical superintendent.

C. H. GRAY has been appointed superintendent motive power for the Chicago, Rock Island & Pacific at El Reno, Okla.

Shop and Enginehouse

HENRY A. M. WHYTE, wheel shop foreman of the Great Northern at St. Paul, Minn., has been appointed superintendent of shops at Superior, Wis.

J. H. MARKS has been appointed general foreman of the Chesapeake & Ohio, Hinton Division, at Hinton, W. Va. Mr. Marks was previously assistant roundhouse foreman at Hinton.

Master Mechanics and Road Foremen

M. T. LLEWELLYN, master mechanic of the Hinton division, Chesapeake & Ohio, at Hinton, W. Va., retired on November 1.

V. V. VIAR, general foreman of the Chesapeake & Ohio at Hinton, W. Va., has been appointed master mechanic of the Hinton division at Hinton.

W. C. REDDICK, traveling mechanical inspector for the St. Louis-San Francisco, has been appointed to the newly created position of assistant master mechanic.

J. A. E. FISET, road foreman of engines of the Canadian National at Winnepeg, has been named master mechanic of the Portage-Brandon division, remaining at Winnepeg.

Car Department

CLARENCE C. LARSON, general car foreman of the Illinois Central, has been appointed assistant superintendent of car department at Gary, Ind.

W. A. EMERSON, superintendent car department of the Elgin, Joliet & Eastern at Joliet, Ill., has retired after 50 years of service.

EDGAR S. SMITH, master car builder of the Florida East Coast, at St. Augustine, Fla., retired on November 1. Mr. Smith was born on November 29, 1867, at Renova, Pa. He became a patternmaker apprentice in the employ of the Chesapeake & Ohio on January 1, 1885. He was subsequently a mechanic on various railroads until 1893 when he became a foreman on the Southern. On January 27, 1903, he became a car foreman on the Louisville & Nashville, and on July 1, 1904, was appointed general foreman car department of the system. He was superintendent of the Damascus Brake Beam Company plants

E. S. Smith

at Sharon, Pa., and Cleveland, Ohio, from July 27, 1907 to November 1, 1912. On January 1, 1913, he became superintendent of the Henderson Iron Works, Shreveport, La. He was car foreman of the Tennessee Central from July 1, 1914 until September 1917, when he was appointed master car builder of the Florida East Coast at St. Augustine. Mr. Smith was a vice-president of the Car Department Officers' Association from 1939 to 1941. During 1935-36 he served on the A.A.R. committee appointed, under the direction of L. W. Wallace, director of equipment research, to study various systems of passenger-car air-conditioning then in use.

VICTOR SMALL, assistant superintendent of car department of the Illinois Central at Gary, Ind., has been appointed superintendent of the car department.

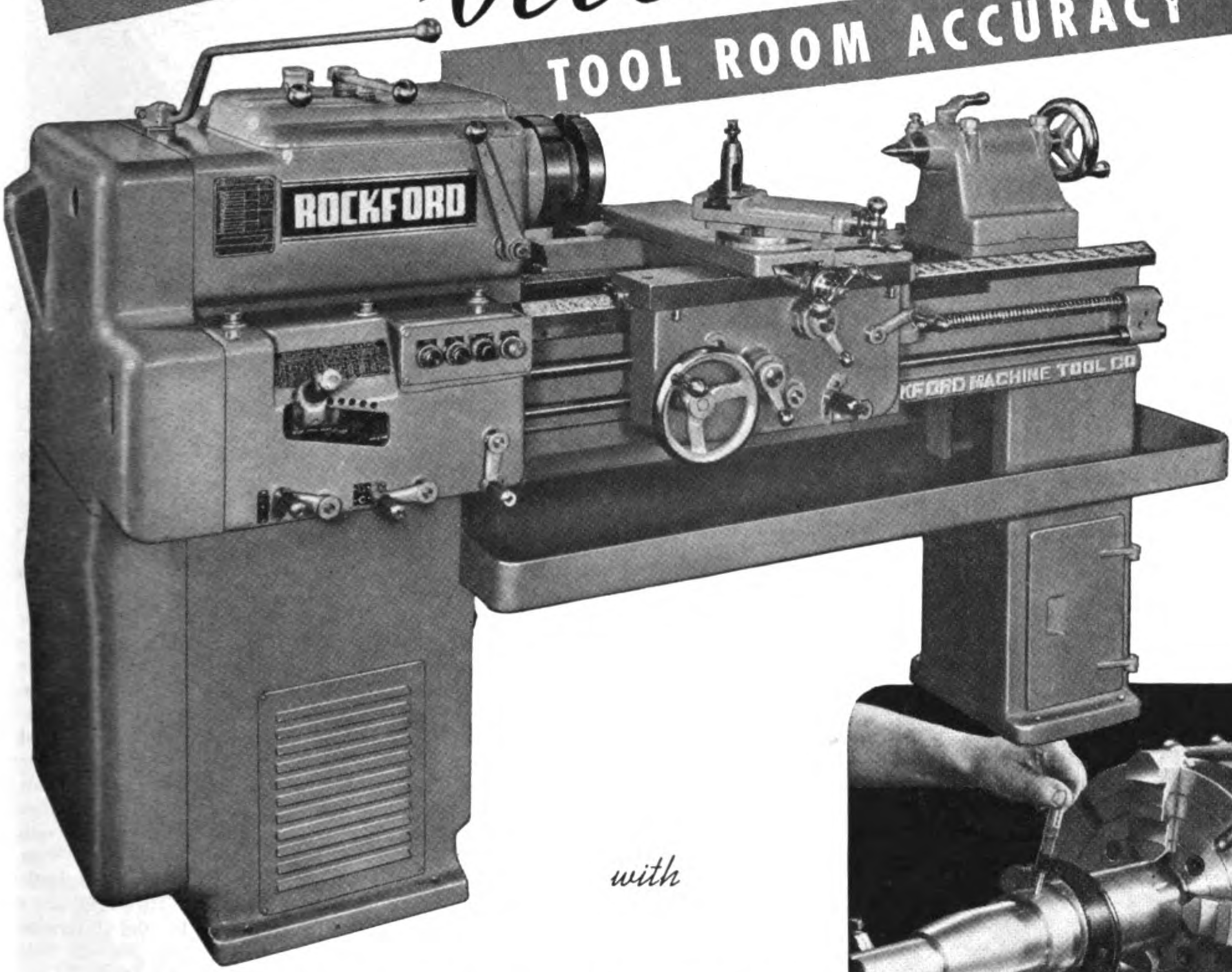
V. G. SMALL, assistant superintendent car department of the Elgin, Joliet & Eastern, at Joliet, Ill., has been appointed superintendent car department, with headquarters at the same point.

HENRY G. HIELSCHER, chief car inspector of the Illinois Central, has been appointed general car foreman at Gary, Ind.

Electrical

HAROLD T. THEIS, who has been appointed chief electrical engineer of the Central of New Jersey as announced in the December issue, was born at Scranton, Pa., on March 26, 1909. He is a graduate of Pennsylvania State College where he received a B.S. degree in electrical engineering. From October 1934 to May 1942, he was, successively, field engi-

PRODUCTION ACCURACY *becomes* TOOL ROOM ACCURACY



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neer for Jensen, Bowen & Farrell; engineer for Day & Zimmerman, Inc.; electrical engineer for the Cramp Shipbuilding Company, and electrical designer for United Engineers & Construction, Inc. From May 1942 to April 1946, he served as electrical and mechanical engineer, U. S. Army Engineer Corps, with the rank of major, serving in the Aleutian

Harold T. Theis

Islands and in Japan. In April 1946 Mr. Theis became associated with Kaiser Metal Products, Inc., as superintendent of maintenance and facilities (plant engineer) and in October 1950 was appointed electrical engineer for the Vitro Corporation of America, which position he held until his appointment as chief electrical engineer of the C.N.J.

Obituary

S. R. Hyett, superintendent of shops of the Great Northern at Superior, Wis., died on November 14.

NEW DEVICES

(Continued from page 88)

Mechanic's Protractor

A handy mechanic's protractor designed for on-the-job measuring of angles up to 180 degrees is made of durable Vinylite plastic rigid sheet that has dimensional stability and is resistant to water, oil, grease and most chemicals. Useful for engineers, carpenters and construction men, inspectors, sheet metal workers, pipe layout men, welders, and many others, the protractor simultaneously gives three readings: for an outside angle, for the adjacent inside angle, and for inches-per-foot against degrees — all with one setting. Spread with edges squarely against sides of an obtuse joint measurement of the adjacent acute angle—angle of bend or deflection—is read from the top row of calibration, while measurement of the obtuse angle itself is read simultaneously from the bottom row. Inches-per-foot of pitch is indicated by a second arrow on a separate scale which runs up to 24 inches per foot, for 63 degrees and 26 minutes. To measure certain inaccessible acute angles, a straight edge may be used to extend one side of the angle. Where the protractor itself cannot be used, the angle may be taken with a carpenter's bevel and the angle of the bevel measured with the protractor, using the middle row of calibrations. Readings accurate to a fraction of a degree are facilitated by location of the calibrations at the extreme of the protractor's radius. The Vinylite plastic rigid sheet of which it is made is easily cleaned with a damp cloth. Calibrations cannot wear off because a lamination of Vinylite plastic affords lasting protection. This mechanic's protractor is produced by the Interstate Sales Co., 123 East 18th Street, New York 3.

◆

Semi-Automatic Welding Head

Fillerweld, a new product designed to speed alloy-metal welding on applications where filler-metal must be added, has been announced by General Electric's Welding Department.

Used with gas-shielded arc welders, Fillerweld allows the operator to control the continuous flow of filler-metal automatically by means of a finger switch mounted on the torch. Designed for the welding of light gage metals, it allows the operator to start or stop the flow of filler metal without breaking the arc.

The unit consists of the torch or gun, and a mechanical power unit. The gun is basically a manual water-cooled inert-arc tungsten holder to which has been added a control switch, and a gear assembly for pulling the filler-metal from the

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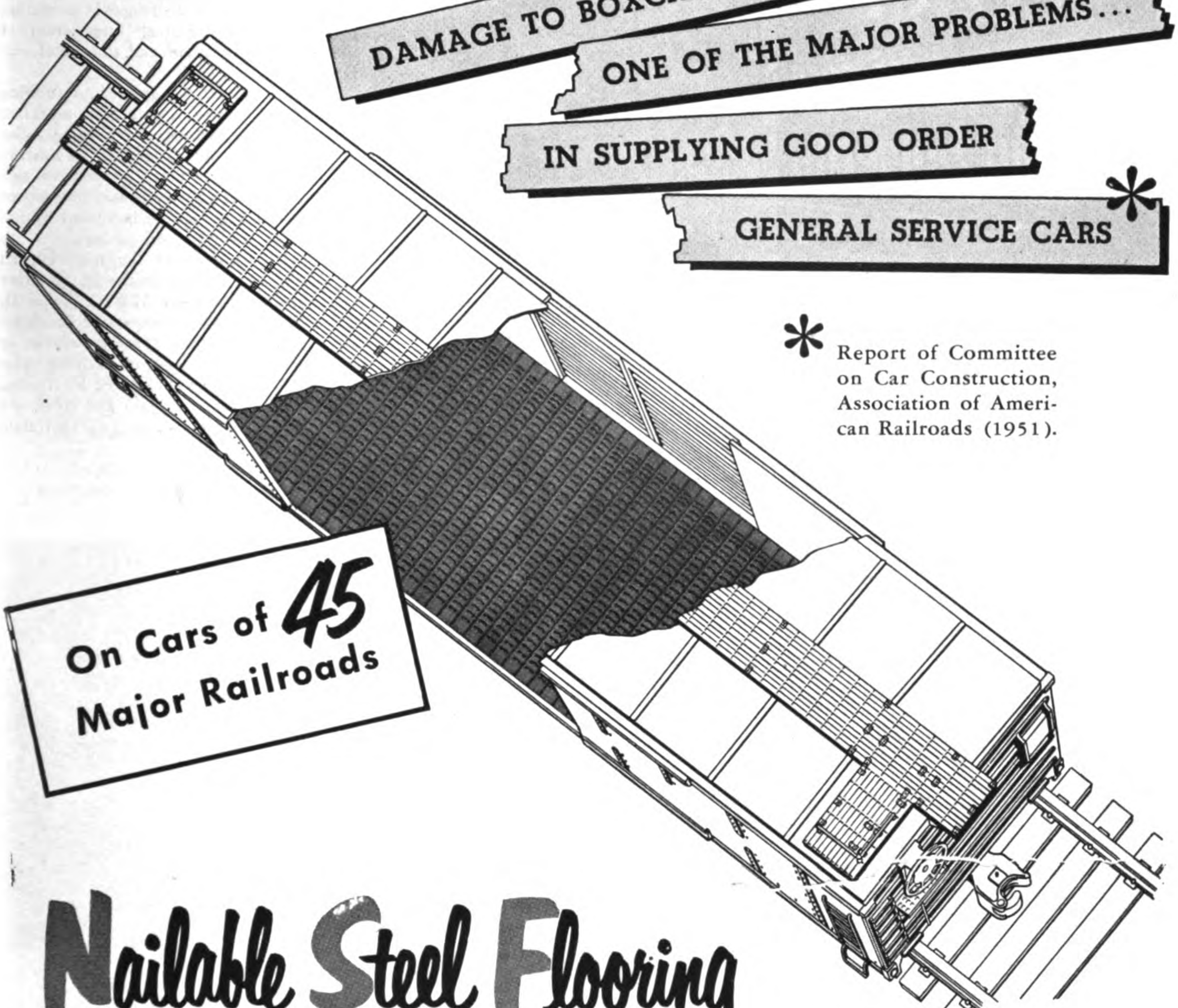

* Report of Committee on Car Construction, Association of American Railroads (1951).

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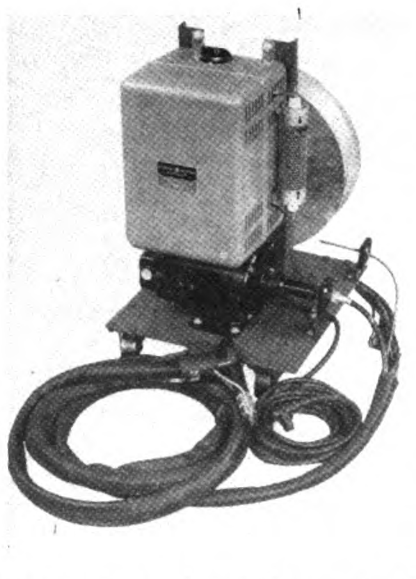
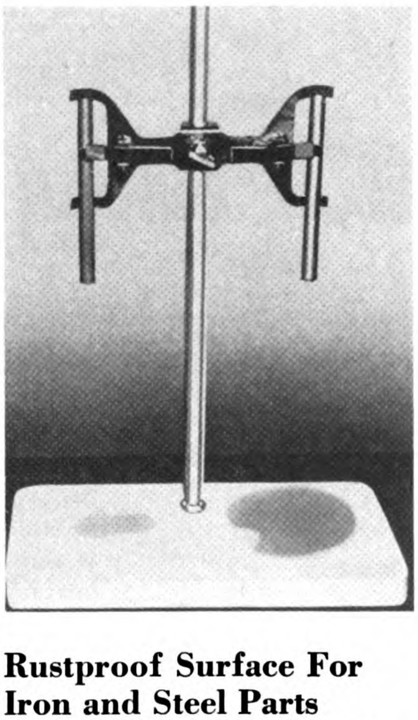


spool to the arc through the gun. Rated at 250 amp., the gun accommodates tungsten from 0.040 to 5/32 in. in diameter and up to 7 in. long.

The mechanical power unit consists of a motor which provides the power for drawing the filler-metal, a Thy-mo-trol unit for controlling the motor, and a spool which holds the filler wire. The unit is mounted on a portable platform and can be moved easily from job to job. The process can be applied to best advantage on stock less than 3/16 in. thick. However, where speed is not of paramount consideration, Fillerweld may be used on thicker material.

◆



Rustproof Surface For Iron and Steel Parts

Moving parts made of iron and steel can get two-fold protection with a chemical treatment announced by Octagon Process, Inc., Staten Island 1, N. Y. Known as "Rustshield 2," it is a phosphatizing compound which changes steel and iron surfaces to rustproof, highly absorbent nonmetallic areas.

Such a surface, with increased surface area, is an ideal base for the retention of lubricating oils. This surface is a coating produced from chemical inter-action of the phosphate solution and the metal surface.

The solution can be applied to rubbing and sliding surfaces of parts such as thrust washers, pump pistons, gears, valve roller pins, stems and guides, as well as bearing surfaces. Although parts treated in this manner are corrosion resistant, the degree of such resistance can be increased by finishing with a drying oil or wax.

The compound meets the requirements for phosphate coatings in the U. S. Army Ordnance Specification 57-0-2C, Type II, Class A. The process consists of precleaning with vapor degreaser, safety solvent, or alkali cleaner designed for cleaning prior to phosphating. This is followed by rinsing. Rustshielding, rinsing again and treatment with a passivating agent, such as Neutralyte solution.

◆

Electrical Tape for Preventing Pipe Corrosion

A heavy-duty plastic electrical tape, designed for applications where more-than-average mechanical strength is needed, has been announced by Minnesota Mining and Manufacturing Company, St. Paul, Minn.

Designated Scotch brand electrical tape No. 21, it is recommended for anti-corrosion protection for pipes, cables and equipment laid underground where resistance to cuts and abrasion by rocks during back-fill is important.

It is also recommended for protecting and insulating cable and high tension leads subject to wear, abrasion and rough handling, and for bus bars carrying high voltage.

The tape has a black, vinyl plastic backing that is 20 mils thick; more than twice the thickness of previous tapes of its type. It has a dielectric strength of 22,500 volts, an insulation resistance of 200,000 megohms, and an electrolytic corrosion factor of 1.0. The tape is available in 36-yd. rolls ranging in widths from ¼-in. to 16 in.

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ELECTRICAL:

EDITORIALS:

NEW DEVICES:

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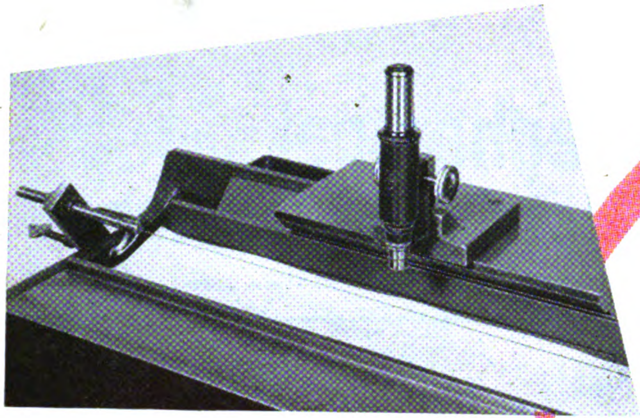
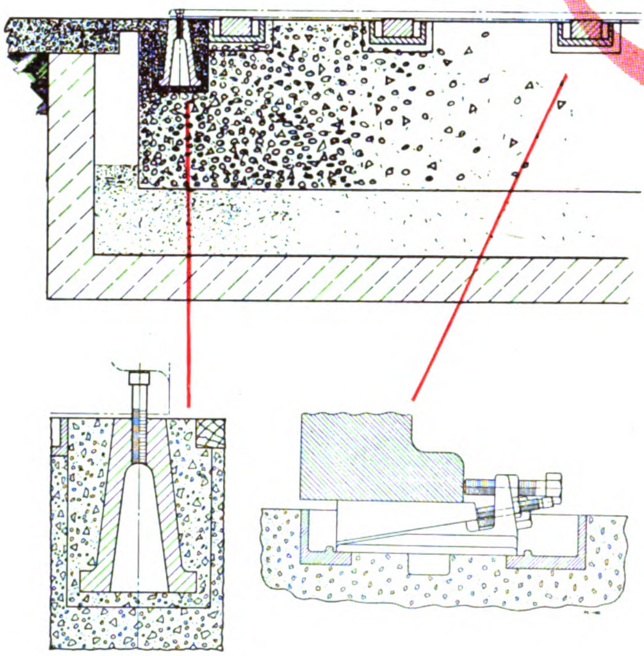


Microscope Aligning Instrument for checking accuracy of table way alignment.



Anchor bolt in foundation prepared especially for the machine.

Leveling blocks should be imbedded in the concrete foundation before the machine arrives.

HELPFUL HINTS FOR TOPNOTCH PERFORMANCE FROM YOUR LARGE CINCINNATI FILMATIC CENTERTYPE GRINDERS

You probably know that large centertype grinding machines are in critically short supply, so it will pay well to do whatever you can to keep yours running. Here are a few suggestions for the larger CINCINNATI FILMATIC Centertype Grinders—the 14" to 28" sizes.

FOUNDATION

Adequate foundations for long precision grinding machines are very necessary. Follow the recommendations outlined in foundation plans supplied with the machines.

LEVELING AND ALIGNMENT

Improperly leveled and aligned machines can be the source of many troubles. Wedge blocks are supplied to facilitate the leveling operation. Periodically recheck accuracy of level. When installing the machine, accurate alignment can be accomplished with the aid of a Microscope Aligning Instrument.

LUBRICATION

of your CINCINNATI FILMATIC Plain and Roll Grinding Machines is simple and easy; do not neglect it. As a reminder, make a lubrication chart and attach it to your machine.

OIL FILTERS

There are three oil filters—one for the FILMATIC spindle bearing lubricating system, and one each for the table way and wheelhead way oil. All are the replaceable type. Change them periodically; once a year should be sufficient.

If you will take these simple preventive measures, you will be well repaid in accurate, dependable performance for many years . . . performance that will match the lifetime dependability of FILMATIC spindle bearings.

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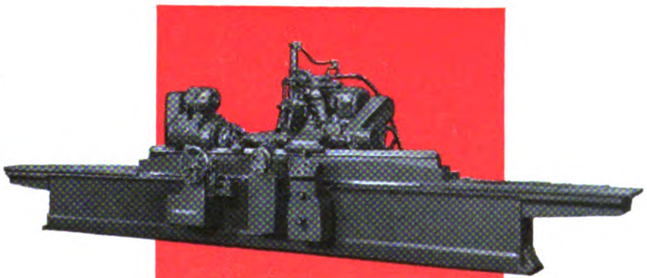

CINCINNATI FILMATIC 16" x 96" Roll Grinding Machine. Catalog No. G-600 contains complete specifications for the 16" Heavy Duty and 20" and 24" Plain and Roll Grinding Machines. Catalog No. G-587 covers the 20", 24" and 28" Heavy Duty Machines. Write for copies of these catalogs.

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CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
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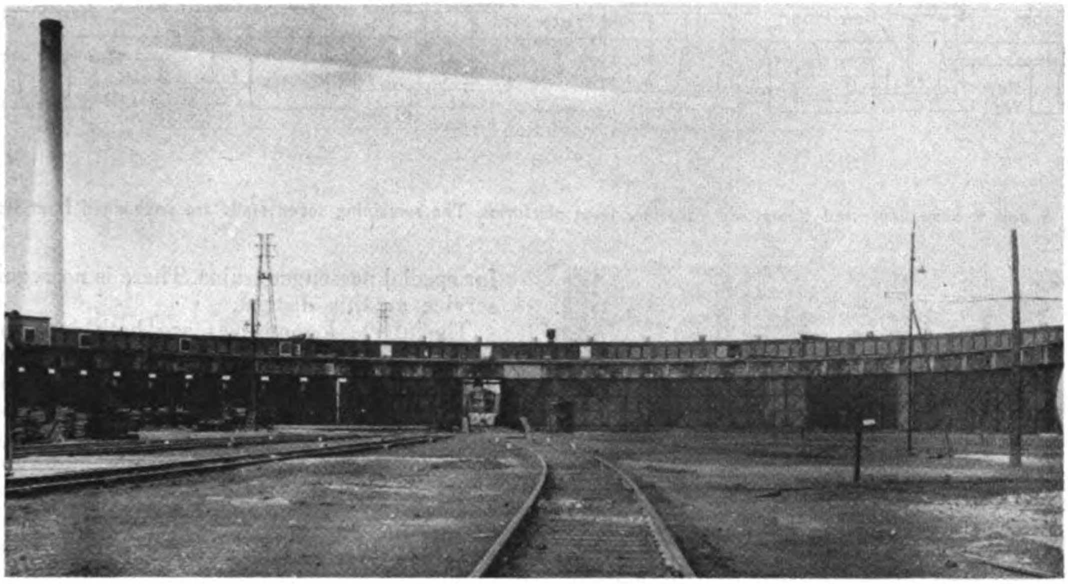
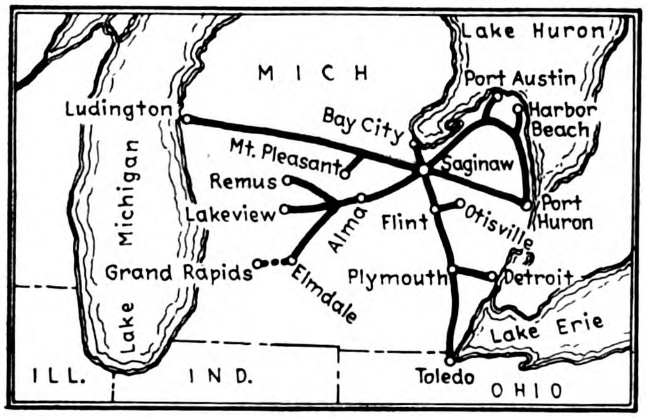


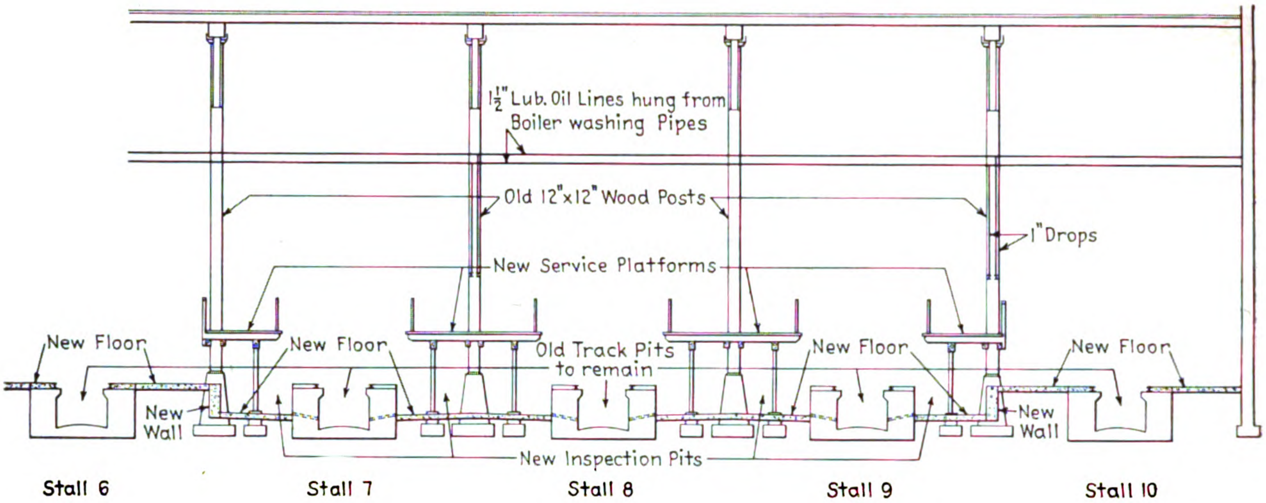
C. & O. Converts Terminal For Handling Diesel Power

Facilities at Saginaw, Mich., have ten working stalls and ten stalls for storing units during layovers

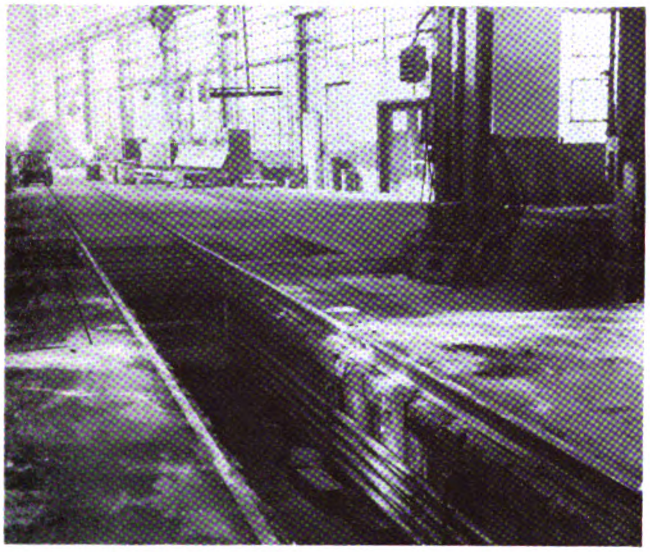
THE Pere Marquette district of the Chesapeake & Ohio has converted its former steam engine house at Saginaw, Mich., to a servicing and maintenance point for diesel power. The locomotives assigned to this terminal handle all traffic on the completely dieselized district shown on the map, with one exception. The trackage between Elmdale, Mich., and Grand Rapids is served primarily by locomotives assigned to the latter point, the Saginaw locomotives operating over this stretch only as part of the through run from Saginaw to Grand Rapids.

The Saginaw pool comprises 48 Electro-Motive units as follows: eight 1,000-hp. switchers, eleven 1,200-hp. switchers, seven BL-2 1,500-hp. road switchers, twenty GP-7 road switchers, and two 2,000-hp. passenger locomotives used mainly in freight services, and occasionally





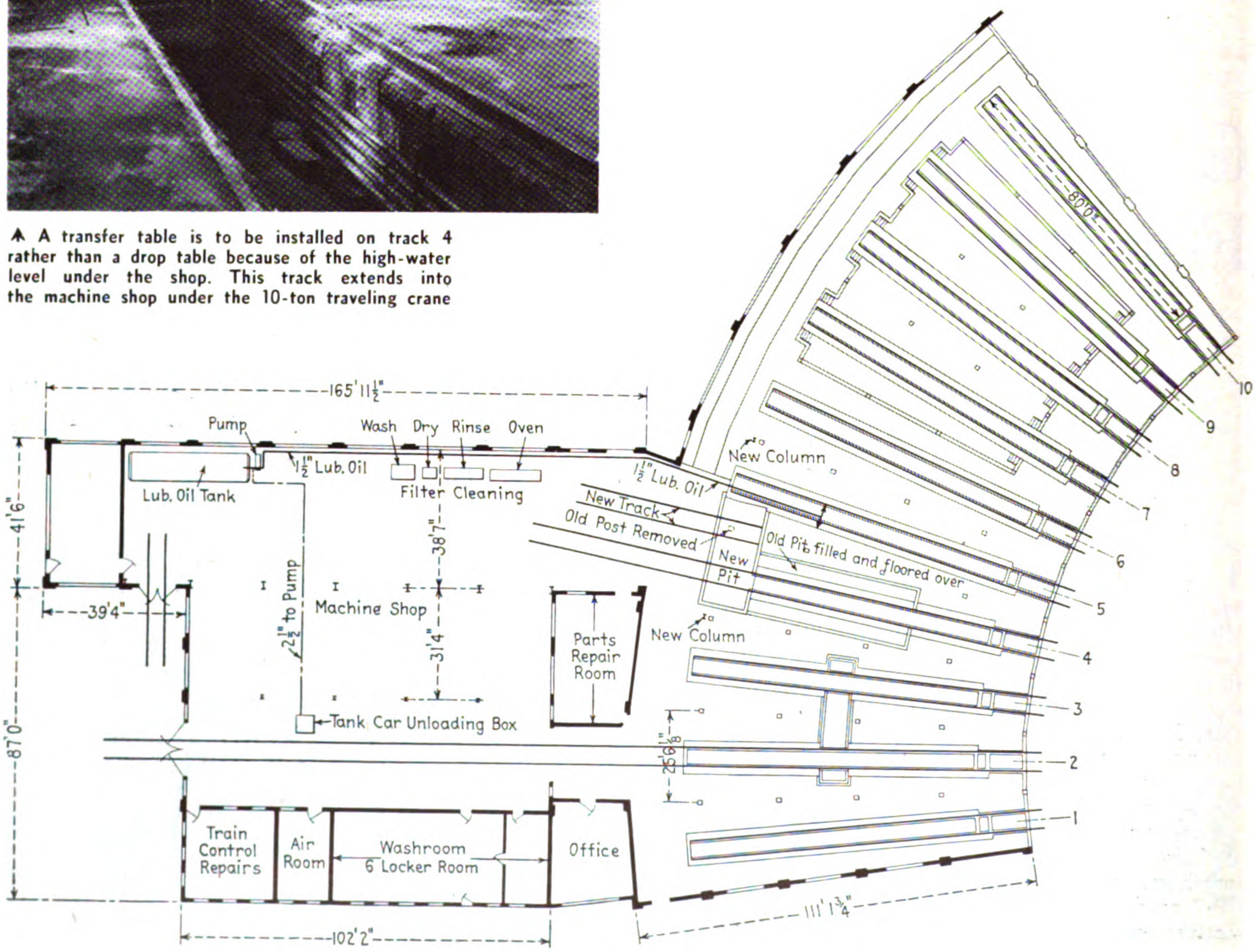
Stalls 7, 8 and 9 have depressed floors and cab-floor-level platforms. The remaining seven stalls are unchanged from steam days

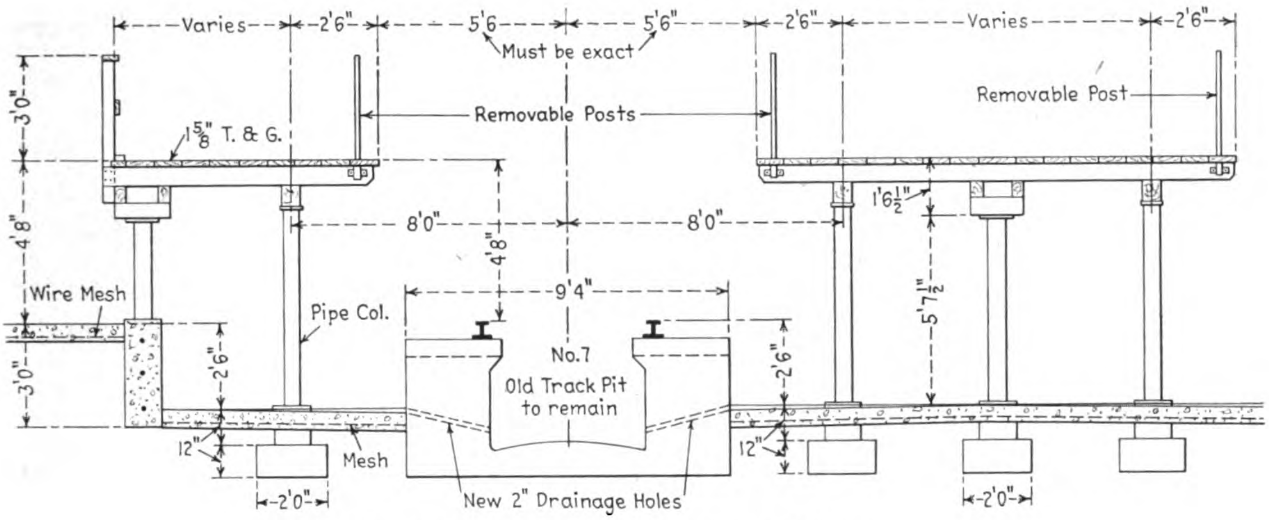


▲ A transfer table is to be installed on track 4 rather than a drop table because of the high-water level under the shop. This track extends into the machine shop under the 10-ton traveling crane

for special passenger trains. There is no regular passenger service on this district.

The above locomotives are both serviced and maintained at Saginaw, except for general overhaul which is performed at the Grand Rapids heavy repair shop. In addition to these 48, annual inspection and repairs to nine switchers stationed at Flint, Mich., are handled at Saginaw. Medium-heavy repairs to these nine up to and including liner pulling is also done at Saginaw. The same





Enlarged section through stall 7 and the adjoining platforms

procedure applies to a switcher stationed at Alma, which does local switching and covers the runs to Lakeview and Remus.

Dispatchments vary from 43 to 47 units each week day, and 25 to 27 on Saturdays and Sundays. All locomotives are brought into the house for servicing. Traction-motor suspension bearings are inspected prior to dispatching each time the locomotive enters the house.

Forty of the 48 locomotives maintained at this point operate in a general pool, and eight are assigned to specific runs. The two 2,000-hp. passenger units handle a time freight between Saginaw and Detroit, making one round trip per day. Three switchers, either 1,000 or 1,200 hp., operating as single-unit locomotives, are assigned to the branch line between Saginaw and Port Huron which runs via Palms. These three locomotives also handle the sub-branches leading from this line. A switcher is assigned to a local to Plymouth, and a second to a local to Mt. Pleasant. A 1,200-hp. switcher is ass'gned to the short, but heavy-tonnage, run to and from Bay City.

A board in the foreman's office, shown in an illustration, tells at a glance on what dates locomotives are due for monthly or more extended periodic inspections for the next 30 days. Each round tab on the board represents a locomotive unit. When a unit has received a monthly inspection, its tab is moved from the lower to the upper area on even numbered months of the year, and from the upper to the lower on odd months.

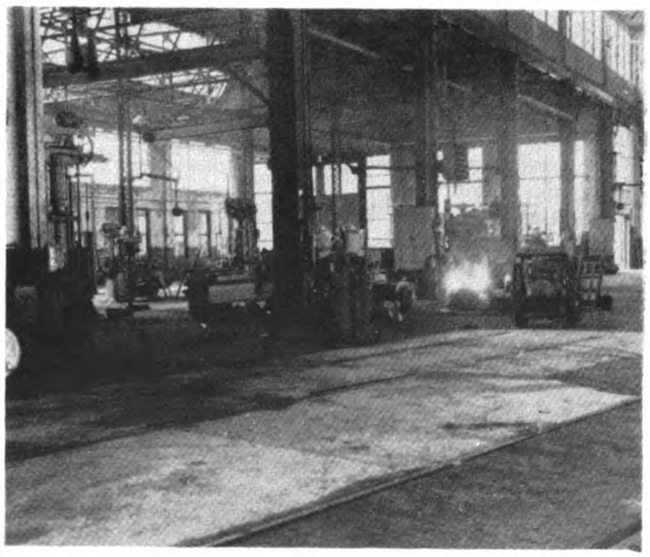
Unit 98, for example, received its monthly inspection October 7, and the tab was raised up to the November 7 position, indicating that it is due for its next inspection on that date. When it has received its November inspection, the tab will be moved to the lower column under the date of 7. By this time, however, the month indicator will have been changed from October to December, showing a due date of December 7 for the monthly inspection to Unit 98.

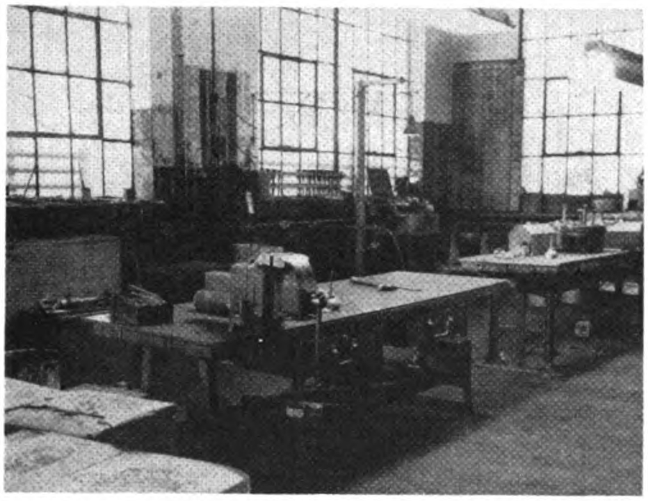
The board also shows any bunching up of work. Thus, five units are due October 12, while only one is due October 11. The foreman can thereby try to get some October 12 units on October 11 to even his out work load.

It can also be seen from the board what type of inspection is due. Tabs with just the unit number on indicate a monthly inspection; those with a red dot indicate an annual inspection. Seven other tabs, shown over dates of October 10-16, show days of the week (Sunday, Monday,

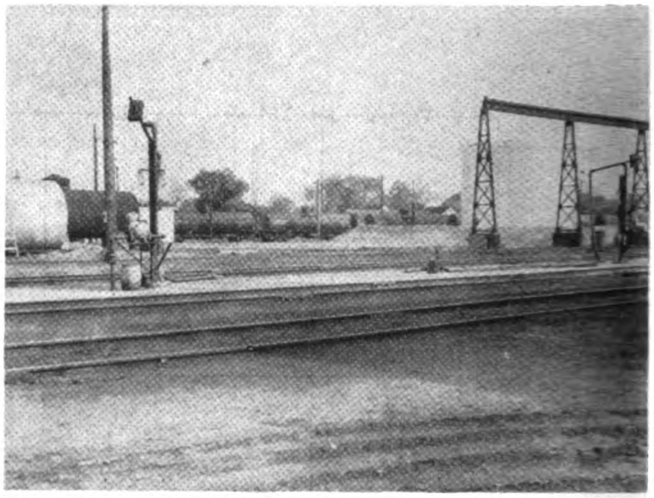
While the three stalls served by the floor-level platforms have depressed floors, the jacking pads were left in place

A new 40-ft. stub extending under the travelling crane was installed parallel to track 4 to serve as the outlet track for the transfer table



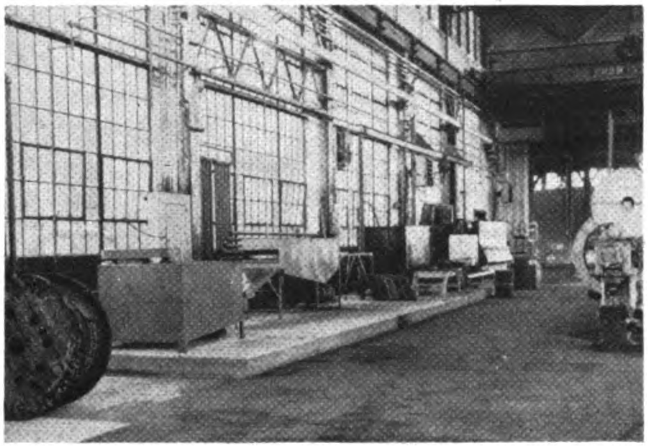


As most heavy repair work is done at Grand Rapids, this small room is adequate for parts reconditioning



Locomotives are fueled before entering the house on the two inside tracks bordering the concrete fuel ramp, where two units can be fueled simultaneously

Cleaning of filters and other parts is done in this area. The raised concrete platform is served by the jib crane in the background



etc.) as an additional guide in keeping the record straight.

The existing steam engine house had 30 stalls, a 100-ft. 6-in. turntable, a machine shop, and the necessary outside fuel, sand and water facilities, lead tracks, etc. The stalls were 80 ft. long and 4 ft. deep; all were heated by steam coils. A 1-ton monorail electric crane ran along the outside periphery of the house to serve all 30 stalls, and a branch extended into the machine shop. The machine shop was also served by a 10-ton travelling crane extending the entire length and having a span of 40 ft. Both cranes were retained.

The engine house, as converted to diesel work, is now divided into three sections. The first ten stalls, with individual modifications as necessary, are used for servicing and maintenance. The second ten stalls are used without change for storage during layover shifts and periods, while the last ten are no longer used.

Steam coils were retained in all stalls except No. 4 where the coils were cut off in installing a transfer table. Lubricating oil is piped directly under pressure to the first ten stalls from the 10,000-gal. tank. Two brands of detergent, heavy-duty oil are used—one exclusively in switchers, and the second for road power. No mixing of different brands is permitted.

The total of 20 stalls was retained for two principal reasons, the major one being for storage of power over weekends, when only half of the units are needed for operation. It is also helpful to have additional capacity in the working area at this point as the bulk of the work must be done on the first shift, on which 17 mechanics are employed, as contrasted with four on the second shift and seven on the third.

The degree of work done on the different parts of the locomotive varies with the part. In general, however, it can be said that most heavy mechanical repairs that become necessary between general overhauls are handled at this point, but that no major repairs are made to electrical equipment. Regularly scheduled heavy repairs to all equipment are done at Grand Rapids where switchers get a major overhaul every three years and road locomotives once each 18 months.

As to work handled on individual components, most engine work except crankshaft troubles and air box blower repairs are performed if the need arises between general overhauls. Auxiliary equipment receives minor servicing only; if serious difficulty exists, the part is replaced by one reconditioned at Grand Rapids.

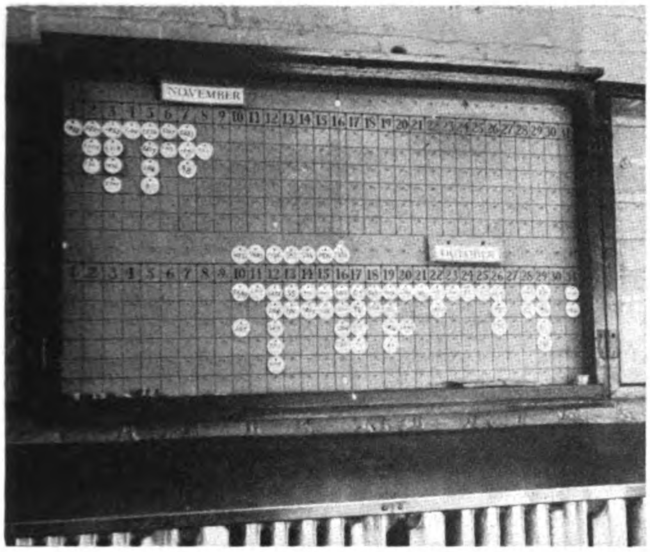
Truck work is handled completely, except that wheels are not turned at this point, but replaced by spare sets from the heavy repair shop at Grand Rapids. Day-to-day maintenance of the tread contour is done as needed with emery brake shoes. Body work is normally limited to minor straightening, but some heavy straightening is done if time permits and conditions dictate.

The majority of electrical work done is of the light type that can be done on the locomotive. Controls, and small motors and generators, are replaced with units reconditioned at Grand Rapids. Traction motors and main generators are maintained only; if necessary to change out, replacements are made with units reconditioned at Grand Rapids or by outside concerns. Batteries are watered only.

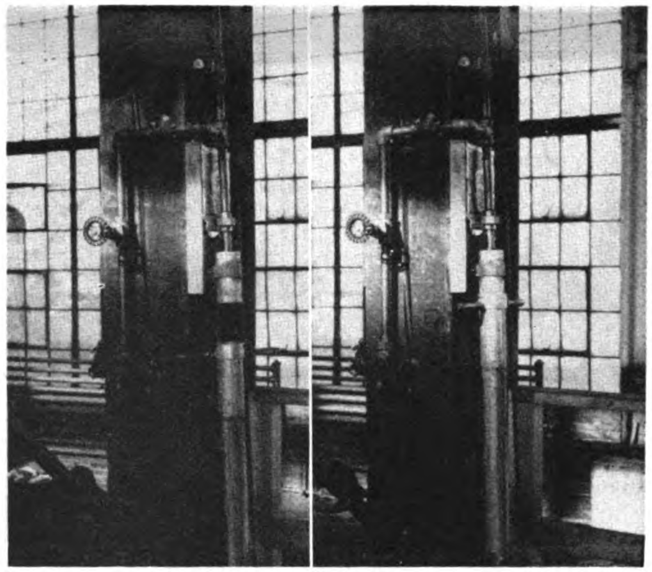
The heaviest work normally performed at Saginaw is that done in addition to I.C.C. work at annual inspections. This includes pulling and testing injectors, changing injector filters, air-testing the cylinders for blow-by, taking leads on the pistons for compression clearance, cleaning all electrical equipment, leads, risers, etc., and tightening all bolts and parts.

Layout of the Facilities

Of the ten stalls in the section devoted essentially to working on the locomotives rather than storing them, six

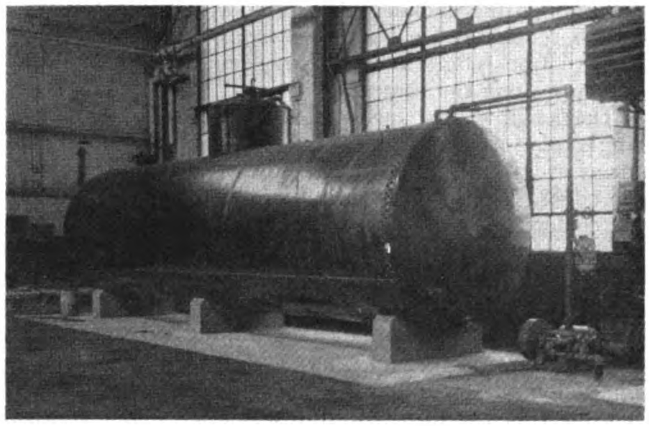


The board in the foreman's office for scheduling monthly, quarterly, semi-annual and annual inspections



Syntex bronze fuel filters are cleaned thoroughly and quickly with steam and blown out by air in this arrangement at stall 8

Lubricating oil is distributed to all stalls from this tank.



are unchanged from the steam locomotive days. Five of these are numbers 1, 3, 5, 6 and 10. The flooring is flush with the top of the rails, and the pits are 4 ft. deep. Daily servicing is done on these tracks without platforms or depressed floors. While this arrangement does not afford ideal working conditions at all times, the hindrance is not appreciable because of the 4-ft. pits.

Track 2 is the sixth track unchanged from the steam days, and, like the preceding five, has a 4-ft. pit 80 ft. long. It also extends into and through the machine shop. It is used primarily for making a quick inspection of suspension bearings, for which the extra length of the track is necessary in the case of multiple-unit locomotives.

Track 4 also enters the machine shop, extending far enough inside to be served by the 10-ton traveling crane, which is used for changing out traction motors, radiator fan arrangements and batteries, and for some engine work. The latter includes pulling heads, pistons and liners when more than one or two are to come out of an engine; where only a couple are to be removed a chain fall is ordinarily employed. This crane is used for this work because of the convenience of its location, and because no smaller crane suitable for this work is available.

A transfer table was installed rather than a drop pit because of the high water table under the house, which would create a serious problem in keeping the pit dry. The table to come will handle four-wheel trucks, and will therefore be suitable for working all locomotive trucks assigned to Saginaw except the two passenger-type units. It will transfer the truck to a stub track which is located halfway between tracks 4 and 5, and which extends into the machine shop area served by the crane.

Four 35-ton electric jacks raise the locomotive for truck changes. The transfer table is used for truck changes on the GP-7 and BL-2 road switchers only; on straight switchers the truck is rolled straight out on track 4.

Stalls 7, 8 and 9 have depressed floors 30 in. below the top of the rail, and locomotive-floor-level platforms 56 in. above the top of the rails. The jacking pads were left in along the outsides of the rails for the entire length of the pit. This arrangement does not provide quite as free a depressed-floor space, but this disadvantage is about compensated for by the extra platform for some truck and body work. It also permits the units to be lifted by electric jacks, if desired.

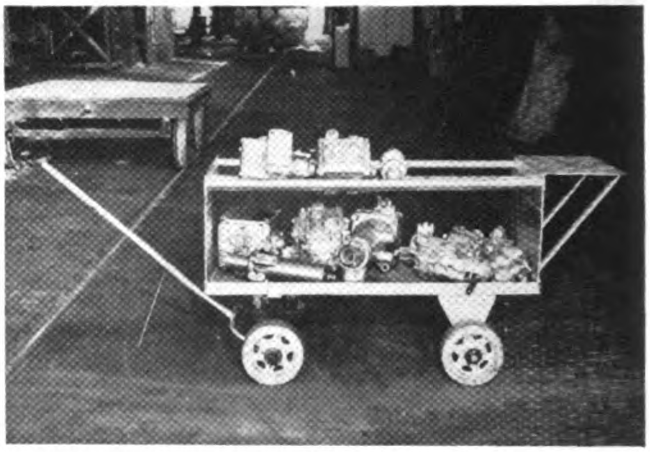
These stalls are used for monthly, quarterly, semi-annual and annual inspections, and for heavy repairs only. They were selected to be modified for this work largely by the process of elimination.

Stall 2 was eliminated as a starting point because it extended into the machine shop and was needed for suspension bearing inspection in between monthly inspections. This automatically eliminated Stall 1, as three stalls in succession were needed. Stall 4 was needed for truck work as it provided access to the crane in the machine shop, thus eliminating stall 3 also. Stalls 5 and 6 were on opposite sides of a fire wall, which eliminated 5; Stall 6 was too close to the wall. Thus Stalls 7-9 were the first three stalls in a row that could conveniently be used.

These three stalls also afford good natural lighting, not being blocked by the machine shop. They are also located reasonably close to the parts repair rooms, the machine shop, the cleaning area, and to the stalls used for daily servicing.

All four platforms are 44 ft. 7 in. long, and overhang the supports along the track edge by 30 in. The two center platforms are 10 ft. wide at the narrow end and 14 ft. 8 in. at the wide end. The end platforms have respective widths of 5 ft. 10 in. and 8 ft. 2 in. Both have guard rails of 2 by 4 lumber 3 ft. above the platforms, and floors of $1\frac{5}{8}$-in. lumber. Supports are steel pipe columns $5\frac{3}{8}$ in. in outside diameter.

The air brake room is compact and well equipped with the necessary tools and test equipment



Air-brake equipment is carried between the air room and the locomotive on this handy cart

Five such columns support the end platforms on the track side, and two supplement the three main building columns on the outside. A similar arrangement is used on the center double platforms, five columns supporting the two track edges and two supplementing the building columns along the center.

The lengthwise stringers along the track sides of the single platforms and the outsides of the double platforms are 6 by 8's. In all cases these run 30 inches from the edges. The inside stringers of the end platforms and the center stringers of the double platforms are two 4 by 6's mounted with the inside edges 10½ in. apart. Joists for all platforms are 2 by 6's on 24-in. centers. Steps and step supports are 2 by 10's. Four lights on the under side of each platform illuminate the running gear.

Syntex-bronze fuel oil filters are cleaned at the end of the double platform between Stalls 7 and 8. The filter is held in a section of tubing into which it fits snugly when in the open position as shown on the left in one of the illustrations. This piece of tubing extends down into a drain line with a slip joint on the lower end which allows it to be moved 6 or 7 inches up or down.

When the filter has been placed in the lower section of tubing, this section is raised to the position shown on the right, in which it fits snugly with the short top section of similar tubing by means of the collar on the lower section. The joint is secured with a slight turn of the handle mounted on the collar. The sections of tubing are then held together by a conventional twist joint consisting of a horizontal slot and a pin.

Cleaning now takes only a few seconds. Steam is admitted by opening the steam-line valve directly above the tubing. After cleaning, the filter is blown out by air admitted through valve in shop air line on the left.

Equipment Used for Diesel Work

A number of the existing machines in the machine shop are used for diesel work, including a power pipe threader, an 18-in. dry grinder, a bolt threader, a ½-in. and a 2-in. drill press. Among the heavier machinery that has been found helpful is a shears and punch press to cut sheets for repairing damaged locomotives, a 50-ton hydraulic press for straightening footboards, and for pressing off fan sheaves and Falk couplings, and a turret lathe for making miscellaneous fitting.

The principal work done in the parts repair room is along the lines of grinding valves, honing liners, repairing cylinder heads, testing lube oil and water, and some minor electrical repairs. This room also serves as a storage point for jobs performed at other locations in the shop. Included among the equipment in the room for both of these purposes is a valve grinder, a fixture for working heads and a diamond holder for facing the seat stone, a honing arrangement, a traction motor pinion puller, an induction heater for applying pinions, a flash-point tester, a radiator water tester, a storage cabinet for cylindrical filters, and storage space for such miscellaneous items as taps, dies, fuel filters, light bulbs, etc.

The air room has the usual array of equipment necessary for complete maintenance of air brake equipment. The principal work done in the train control room is on inductors, the remaining work on train control equipment being mainly minor adjustments and parts replacement. Major work on all parts, including motor-generator sets, is done at Grand Rapids.

General Operating Procedures

There are four principal tracks for moving locomotives in and out of the house. These line up with Stalls 14-17. Inbound locomotives enter on either of the two inside tracks, taking fuel on the way in, from the fueling station between these two inside tracks. The fueling station has two 300-g.p.m. pumps and can fuel two units simultaneously. Outbound locomotives for Grand Rapids and Ludington leave the house on a fifth lead track which lines up with retired Stall 30, and is roughly at right angles to the other four lead tracks. This track is used for this movement because the Saginaw yard is triangular, and if the other lead tracks were used the locomotive would have to go around two sides of the triangle to couple to its train. Locomotives are sanded from the old steam locomotive arrangement, using hoses off the side.

Lubricating oil is changed on the basis of test results, not mileage. Flash point tests are made weekly, and a full chemical test monthly. The test dates in each month for making the weekly flash point test are stenciled near the bayonet gage; the monthly chemical test is made at each monthly inspection. Crankcase fortification on makeup oil is not practiced.

Radiator water is treated in the engine, using regular city water as it comes from the tap. Saginaw has an unusually good water supply, which is used for batteries as well as radiators.

Economics of Freight-Car Roller Bearings*

By O. J. Horger†

Costs of Operation and Maintenance

This economic study was based on a one-year period of operation between July, 1950 and June, 1951 for which the Association of American Railroads gave a total of 34,719,916,640 car miles and 193,758 cars set off between division terminals. Detail studies now being conducted by an engineering-economic group in an educational institution provided some maintenance and operating statistics regarding the plain bearing on two Class I railroads operating in different regions of the United States. These data, along with other experiences, were resolved into costs per 1,000 car miles incorporating prices given in the A. A. R. interchange code of rules; such costs were then applied here to the yearly mileage of all Class I railroads. In doing this, it is recognized that the costs found on two railroads, operating only about 6 per cent of the loaded and empty freight car mileage for the country, or from other individual sources, may result in values higher or lower than the actual national average. The type of information needed in this analysis is not obtainable from the usual reports rendered by railroads so that it was necessary to use accessible data in this progress report until more is available.
data for roller bearings is given in Table 5. A summarized comparison statement of operating and maintenance costs for both types of bearings appears in Fig. 18. Detail calculations supporting the above tabular

*Part II of a paper presented by the Railroad Division, American Society of Mechanical Engineers, at the annual meeting, Atlantic City, N. J., November 28, 1951. Part I appeared in the January issue.
†Chief Engineer, Railway Division, Timken Roller Bearing Company, Canton, Ohio.

Tables 3 and 4 and Fig. 17 show the costs of plain hearing hot boxes and service failures whereas similar data are presented in the appendix.

Railroad operating personnel, in criticizing the plain bearing, frequently cite the poor hot box performance record and the number of cars which must be set off between division terminals. As shown in Fig. 18, these costs are $1.61 per 1,000 car miles or only about 22 per cent of $7.34 found for overall costs of maintenance and operation of the plain bearing. Perhaps little objection has been raised to the remaining 78 per cent portion because of the accepted and routine nature of the maintenance work involved and, what is possibly more important, this expense does not present the spectacular interference with road operation. So that while service failures cause concern but only cost 22 per cent of the total expense, the preventive maintenance costs are actually still a more serious proportion or 78 per cent.

A saving of $6.49 per 1,000 car miles is obtained (Fig. 18) for roller bearings over plain bearings or $110.33 per car per year for an average annual mileage of 17,000 miles. About 36 per cent of this saving is in labor, 7 per cent in material, 16 per cent in locomotive hours and nearly 37 per cent in car days. Here a locomotive hour value of $35.00 and an average revenue earning capacity of a car of $10.00 is used.[23]

A separate statement of the total locomotive hours and

TABLE 3—COSTS ON PLAIN BEARING HOT BOXES AND DEFECTIVE BEARINGS (SERVICE FAILURES) PER 1000 CAR MILES*

All Costs in Cents

	Cut journals							
	1st axle	2nd axle same car	Rebrass to repair track	R. & R. to repair track	Road rebrass	Rebrass	R. & R.	Total
HOT BOXES ON CARS SET OFF								
Number of cases	133,800	6,800	13,600	17,400	29,000	......	......	193,800
Cost of locomotive and car delays								
1. Locomotive delays due to set offs	13.488	......	1.370	1.754	2.923	......	......	19.536
2. Car delays in train due to set offs	9.634	......	0.979	1.253	2.088	......	......	13.954
3. Car delays lost on set offs and repair track	15.415	......	1.567	2.005	1.671	......	......	20.657
4. Total delays (1 + 2 + 3)	38.537	......	3.916	5.012	6.682	......	......	54.147
Labor Costs								
5. At point of set off	6.397	......	0.650	0.832	1.387	......	......	9.266
6. At repair track	6.070	0.197	0.062	0.079	......	......	......	6.408
7. Total labor (5 + 6)	12.467	0.197	0.712	0.911	1.387	......	......	15.674
8. Material	3.697	0.174	0.207	0.193	0.293	......	......	4.565
9. Total labor and material (7 + 8)	16.164	0.371	.919	1.104	1.680	......	......	20.239
10. Total costs (4 + 9)	54.701	0.371	4.835	6.116	8.362	......	......	74.386
HOT BOXES AND DEFECTIVE BEARINGS OTHER THAN SET OFFS FOUND IN SERVICE								
Number of cases	285,400	10,000	......	......	......	166,900	48,300	500,600
11. Cost of car delays lost at repair track	24.660	......	......	......	......	14.421	4.173	43.254
12. Labor	12.947	0.290	......	......	......	0.757	0.219	14.213
13. Material	6.181	0.196	......	......	......	1.548	0.448	8.374
14. Total labor and material (12 + 13)	19.128	0.486	......	......	......	2.305	0.667	22.587
15. Total costs (11 + 14)	43.788	0.486	......	......	......	16.726	4.840	65.841
16. Accidents (Appendix Item 15)	......	......	......	......	......	......	......	19.414
17. Fires (Appendix Item 16)	......	......	......	......	......	......	......	1.590
18. Grand Total Cost per 1000 car miles for service failures only, excluding cost of scrapped axles and switching costs	......	......	......	......	......	......	......	161.231

*Excluding Cost of Axles Scrapped because of Cracked or Worn Journals and Switching Costs
Above values obtained by dividing total cost in Table 5 by 34,719,916,640 miles.

TABLE 4—TOTAL COSTS ON PLAIN BEARING HOT BOXES AND DEFECTIVE BEARINGS—SERVICE FAILURES*

All costs in dollars unless otherwise shown

	Cut journal 1st axle	Cut journal 2nd axle same car	Rebrass to repair track	R. & R. to repair track	Road rebrass	Rebrass	R. & R.	Total
Hot boxes on cars set off:								
Number of cases in year	133,800	6,800	13,600	17,400	29,000	......	......	193,800
Locomotive and car delays—costs:								
1. Locomotive delays due to set offs	4,683,000	......	476,000	609,000	1,015,000	......	......	6,783,000
2. Car delays in train due to set offs	3,345,000	......	340,000	435,000	725,000	......	......	4,845,000
3. Car delays lost on set offs and repair track	5,352,000	......	544,000	696,000	580,000	......	......	7,172,000
4. Total delays (1 + 2 + 3)	13,380,000	......	1,360,000	1,740,000	2,320,000	......	......	18,800,000
Labor costs:								
5. At point of set off	2,221,080	......	225,760	288,840	481,400	......	......	3,217,080
6. At repair track	2,107,350	68,544	21,420	27,405	......	......	......	2,224,719
7. Total labor (5 + 6)	4,328,430	68,544	247,180	316,245	481,400	......	......	5,441,799
8. Material	1,283,543	60,472	71,985	67,129	101,732	......	......	1,584,861
9. Total labor and material (7 + 8)	5,611,973	129,016	319,165	383,374	583,132	......	......	7,026,660
10. Total costs (4 + 9)	18,991,973	129,016	1,679,165	2,123,374	2,903,132	......	......	25,826,660
11. Average cost per case	141.94	18.97	123.47	122.03	100.11	......	......	133.26
12. Cost per 1,000 car miles—cents	54.700	0.372	4.836	6.116	8.362	......	......	74.386
Hot boxes and defective bearings other than set offs:								
Number of cases	285,400	10,000	......	......	......	166,900	48,300	500,600
13. Car delays lost at repair track—costs	8,562,000	......	......	......	......	5,007,000	1,449,000	15,018,000
14. Labor costs	4,495,050	100,800	......	......	......	262,867	76.072	4,934,789
15. Material costs	2,146,208	68,200	......	......	......	537,418	155,526	2,907,352
16. Total labor and material (14 + 15)	6,641,258	169,000	......	......	......	800,285	231,598	7,842,141
17. Total costs (13 + 16)	15,203,258	169,000	......	......	......	5,807,285	1,680,598	22,860,141
18. Average cost per case	53.27	16.90	......	......	......	34.79	34.79	45.66
19. Cost per 1,000 car miles—cents	43.788	0.487	......	......	......	16.726	4.840	65.841
20. Accidents (Appendix Item 15)	......	......	......	......	......	......	......	6,740,525
21. Fires (Appendix Item 16)	......	......	......	......	......	......	......	552,047
22. Grand total costs for service failures only excluding cost of scrapped axles and switching costs (10 + 17 + 20 + 21)								55,979,373
23. Grand average cost per 1,000 car miles—cents	......	......	......	......	......	......	......	161.23
24. Grand average cost per case—dollars	......	......	......	......	......	......	......	288.85

* Excluding cost of axles scrapped because of cracked or worn journals and switching costs.

Above costs obtained by multiplying number of cases by unit cost; unit costs given in appendix for locomotive delay (Items 5 x 9). Car delay in train (6c by 9), car delays on set offs and repair track (10 x 6a), labor and material (4).

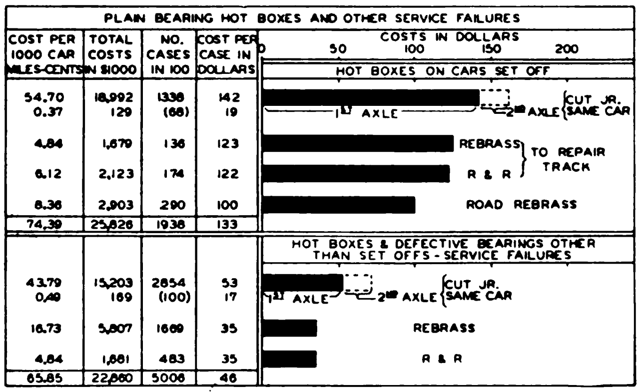
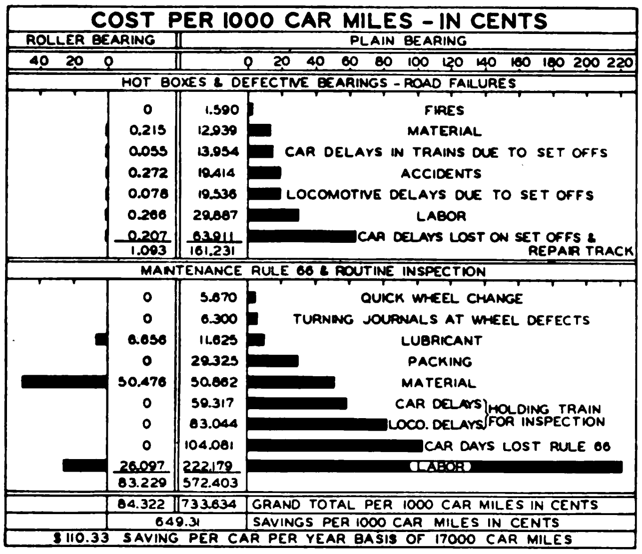


Fig. 17—Average cost of plain bearing hot boxes and other service failures

Fig. 18—Cost comparison and savings of roller bearings over plain bearings on all freight cars of Class I railroads



car days saved by the use of roller bearings is given in Figs. 19 and 20. These figures indicate that the same traffic could be handled with 117 less locomotives and 22,933 less freight cars representing an aggregate capitalization of $150,065,000. In his discussion of the railroad industry Budd[24] cited the hot box as being the most serious of purely mechanical problems of railway operation and termed the resulting loss of car days as "appalling" even though he admitted no statistics were available.

In the case of the roller bearing (Fig. 18) about 31 per cent of the operation and maintenance cost is labor and about 68 per cent material. Practically all of this cost is associated with bearing maintenance at the time the car is on the repair track for wheel work or air brake inspection. There should be no need for bearing maintenance at other times except for service failures recognized in Fig. 18. Mention should be made that the labor item of $2.22 per 1,000 car miles in Fig. 18 only includes the oilers who perform work on the plain bearing that would not be required on the roller bearing at time of train inspection. It is recognized here that mechanical inspection must be made of the train regardless of the type of journal bearing used. An inspector would continue to walk along the train and "feel" each journal box with either type of bearing.

The quick wheel change feature of the roller bearing truck is only shown evaluated on the basis of one-half of the cars having this feature[25] by truck side frame design in Fig. 4. The remaining one-half of the cars would have roller bearings applied in the integral box

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[23] See Items 5 and 6 of appendix for these values. The $1.75 per diem for freight cars does not reflect the actual economic value, but if this value was substituted in this analysis for the $10.00 used, then the savings would be $4.50 per 1,000 car miles or $76.50 per year instead of those given in Fig. 18.

[24] Address by John M. Budd before the Coordinated Railway Association, Railway Purchases and Stores, October 1951, p. 86-89. An abstract of this address appears in the *Railway Mechanical and Electrical Engineer*, November, 1951, page 109.

[25] See item 18 in appendix; only one half of the cars were considered here to be so equipped because roughly one half the cars are over 20 years old and when replaced could be made to Fig. 4; otherwise, integral box side frames (Fig. 1) on cars under 20 years old would be used.

TABLE 5—NUMBER AND COSTS OF ROLLER BEARING HOT BOXES AND DEFECTIVE BEARINGS (SERVICE FAILURES)*

	Total costs in dollars				Costs per 1000 car miles in cents			
	Set offs Road change	Set offs to repair track	Other than set offs	Total	Set offs Road change	Set offs To repair track	Other than set offs	Total
Number of cases in year	260	510	1,545	2,315	260	510	1,545	2,315
Cost of locomotive and car delays:								
1. Locomotive delays due to set offs	9,100	17,850	......	26,950	0.026	0.051	......	0.077
2. Car delays in train due to set offs	6,500	12,750	......	19,250	0.019	0.037	......	0.056
3. Car delays lost or set off and repair truck	5,200	20,400	46,350	71,950	0.015	0.059	0.133	0.207
4. Total delays (1 + 2 + 3)	20,800	51,000	46,350	118,150	0.060	0.147	0.133	0.340
Labor costs:								
5. At point of set off	20,696	8,466	......	29,162	0.060	0.024	......	0.084
6. At repair track	4,914	19,404	38,934	63,252	0.014	0.056	0.112	0.182
7. Total labor (5 + 6)	25,610	27,870	38,934	92,414	0.074	0.080	0.112	0.266
Material costs:								
8. At point of set off	8,388	......	......	8,388	0.024	......	......	0.024
9. At repair track	......	16,453	49,842	66,295	......	0.047	0.144	0.191
10. Total material (8 + 9)	8,388	16,453	49,842	74,683	0.024	0.047	0.144	0.215
11. Total labor and material (7 + 10)	33,998	44,323	88,776	167,097	0.098	0.127	0.256	0.481
12. Total costs (4 + 11)	54,798	95,323	135,126	285,247	......	......	......	......
13. Average cost per case	210.76	186.91	87.46	123.22	0.158	0.274	0.389	0.821
14. Accidents (Appendix Item 15)	......	......	......	94,367	......	......	......	0.272
15. Grand total costs for service failures only (12 + 14)	......	......	......	379,614	......	......	......	......
16. Grand average cost per case	......	......	......	163.98	......	......	......	1.093

* Excluding costs of defective axle and switching costs.
Above costs obtained as shown in footnotes under Tables 3 and 4.

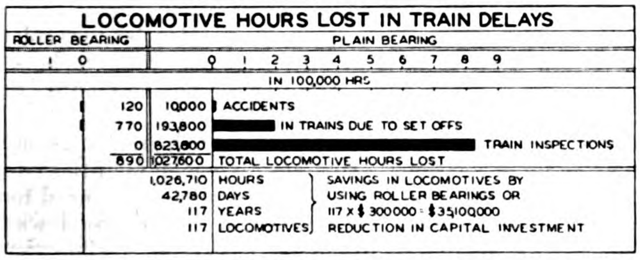
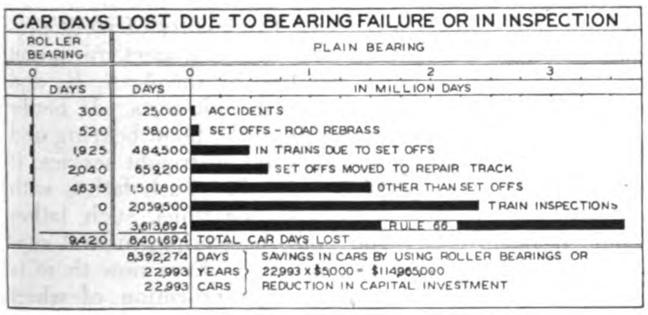


Fig. 19—Locomotive hours lost in train delays with both types of freight-car journal bearings

Fig. 20—Car days lost with both types of freight-car journal bearings



type of side frame without the quick wheel change feature in Fig. 1.

Cost of Applying Roller Bearings

The cost of applying roller bearings on a new or converting an existing 50-ton car are given in Table 6 along with the credits for the omission of plain bearings. It is not known what charge the car builders would make for the roller bearing application so these costs are based on the work being done in a railroad shop. The usual railroad practice can be applied here of adding 60 per cent overhead on direct machining and assembly labor plus stores expense on material purchased. This 60 per cent includes 35 per cent for shop overhead, 10 per cent stores expense, and 15 per cent for pensions, vacations, etc. Furthermore, the price shown for the roller bearings and journal box parts of $550 is based on quantity production lots not realized at this time, whereas the limited quantities currently purchased are considerably in excess of this figure.

TABLE 6—COST OF ROLLER BEARINGS APPLIED TO 50-TON FREIGHT CAR BASIS OF RAIROAD DOING WORK IN ITS OWN SHOP

Item	Cost per car set—dollars: Covering existing cars using worn axle and side frames (Fig. 1)	Cost per car set—dollars: New cars using new axle forging and new side frames (Fig. 4)
Charges For Roller Bearing Application		
1. Roller bearing journal boxes and all mounting parts	$550.00 (Based on production lots not yet attained)	
2. Additional machining cost of roller bearing axle (Table 8)	21.44	12.16
3. Journal box assembly, pressing on axles and lubrication	22.40	22.40
4. Grease	3.60	3.60
5. Burning-out integral box side frame	21.02	.....
6. Total (1–5)	618.46	588.16
Credits For Omission Plain Bearings		
7. Rough turned axle (Table 7)	.....	10.16
8. Side frame (Fig. 4)	.....	72.20
9. Split bushings and wear plates on journal box hinge lug	.....	6.60
10. Eight journal bearings (AAR Rule 101, Item 162-D)	56.00	56.00
11. Eight wedges	16.00	16.00
12. Eight dust guards	1.36	1.36
13. Eight dust guard plugs	0.80	0.80
14. Eighty lb. packing	2.80	2.80
15. Eight packing retainers	4.16	4.16
16. Eight lids	17.20	17.20
17. Packing boxes	2.29	2.29
18. Total (7–17)	100.61	189.57
19. Stores expense	18.07	14.51
20. Application cost rollers bearings over plain bearings (6–18+19)	535.92	413.10

Item 3: 8 man hrs. at $1.75 plus 60 percent overhead.
Item 4: 20 lb. at 18 cents per lb.
Item 5: 5⅓ man hrs. at $1.95 plus 60 percent overhead plus $4.42 for gas.
Item 19: 4 percent (550.00 − 100.61 + 2.29) = 18.07; 4 percent (550.00 − 189.57 + 2.29) = 14.51.
No shipping charges included in above table.

It is apparent from Table 6 that the increased cost in applying roller bearings on a new car is $413.10 while the conversion of existing cars is $535.92 representing a difference of $122.80. About 76 per cent of this difference is allocated to two items of side frame cost and 16 per cent to two factors concerning the axle.

On the side frame, one item of $22.02 is for burning-out a portion of the journal box on the integral box side frame (Fig. 1) and the other being a credit of $72.20 for the jaw type frame (Fig. 4) as compared with the integral box (Fig. 1). The price schedule for conversion cars was based on using a worn plain bearing axle

TABLE 7 — AXLE WEIGHT AND COST DIFFERENCE OF ROUGH TURNED AXLES FOR BOTH TYPES OF BEARINGS

	Axle size, Lb. each 5 by 9 (In.)	5½ by 10 (In.)	6 by 11 (In.)
Plain bearing:			
Rough turned	698	833	1015
Finished	668	799	973
Roller bearing:			
Rough turned	664	791	958
Finished	638	761	924
Decreased weight roller bearing axle:			
Rough turned	34	42	57
Finished	30	38	49
Decreased cost of roller bearing axle over plain bearing axle, both rough turned at 6.05 cents per lb.	$2.06	$2.54	$3.45

TABLE 8 — ADDITIONAL FINISHING COST OF ROLLER BEARING AXLE OVER PLAIN BEARING†

Operation	Man hrs. per axle	Hourly rate (dollars)	Cost of finishing roller bearing axle from (dollars): Worn plain bearing axle — Labor	Worn plain bearing axle — 60 per cent overhead	Worn plain bearing axle — Total	New axle forging* — Total	New axle forging* — 60 per cent overhead	New axle forging* — Total
Power saw cut-off both ends of axle	0.5	1.60	0.80	0.48	1.28	....	....	....
Recenter both ends	0.33	1.95	0.65	0.39	1.04	....	....	....
Drill and tap both ends of axle	0.307	1.95	0.60	0.36	0.96	0.60	0.36	0.96
Grind journals and dust guard	0.666	1.95	1.30	0.78	2.08	1.30	0.78	2.08
Finishing costs over plain bearing per axle	....	....	....	....	5.36	....	....	3.04

† Based on method used by some railroad shops, i.e. direct labor plus 60 percent overhead.
* Forged to length, rough turned, and centered by axle manufacturer.

which requires cutting off each end of the axle and recentering for a cost of $9.28 per car set. In the case of the new car, it was considered that a rough turned axle forging would be purchased which is expected will be $10.16 less per car set than for plain bearing axles. In view of these axle charges, the railroad would find it advantageous to save both items of $9.18 and $10.16 by purchasing new rough turned axle forgings for roller bearings up to the quantity of new plain bearing axles usually procured for maintenance and then continue the second hand plain bearing axle, removed from the conversion car, in service under other plain bearing cars. A similar procedure could be followed on the side frames to save both the $22.02 and $72.20 items by purchasing new frames for roller bearings (Fig. 4) up to the quantity of new plain bearing integral box frames usually procured for maintenance purposes.

Table 8 gives the weights of rough turned axles for both types of bearings as furnished by the axle manufacturer and the corresponding finish machined weight. It will be noted that the rough turned weight is less for the roller bearing which should reflect in the reduced cost values given where this value is $10.16 for a 50 ton car. The finish turning and burnishing of the axle is considered to be the same for both types of bearings. The extra operations involved on the roller bearing axle and not required for the plain bearing are drilling and tapping the ends of the axle and grinding the journal and dust guard diameters. The time and cost of these operations are shown in Table 8 incorporating 60 per cent railroad shop overhead. The additional cost for a 50 ton roller bearing axle would be $12.16 per car set when new axle forgings are used and $21.44 when worn plain bearing axles are remachined.

While Table 6 gives $413.10 as the additional cost for roller bearing application over a plain bearing on a 50 ton car this figure for a 40 ton car would be about $27.00 less and for a 70 ton car about $40.00 more.

Facilities for Roller Bearings

Roller bearings will require inspection and maintenance comparable to that given other types of high grade mechanical equipment already being serviced by the railroads. Roller bearing work will be handled at centralized shops as contrasted with the many outlying points maintaining plain bearings. The extensive supporting facilities ordinarily required for plain bearings will not be required and it will be possible to eliminate many of these facilities so as to reduce the annual maintenance and depreciation charges.

To insure maximum performance of the roller bearing inspection could be made in centralized wheel shops at the same time that the axle assembly is in the shop for wheel renewal. The journal box assembly is pressed off with the wheel so no special tools are necessary. Since the axle must be magnetically inspected, this operation leaves the axle stripped of all mounted parts. Facilities should be provided for cleaning, inspection bench, air jacks at each end of the axle in the production line for pressing bearings on the axles, and grease guns. Axle journals will require grinding equipment already available in some wheel shops or in most locomotive shops. Standard drilling and tapping heads can be mounted horizontally for providing means of placing holes in the ends of the axles. Grease guns will also be necessary at repair tracks for lubrication of the journal boxes while the car is being given periodic 36-month air brake inspection.

The elimination of cut journals would greatly reduce the handling, storage, repair track, and shop facilities now provided for plain bearings. There would be no need for maintenance of many existing facilities concerned with lubrication of the plain bearing such as reclamation plants for packing and shipping and distribution of this packing and bulk oil storage accommodations.

There are hundreds of mounted journal lathes at various outlying points on all Class I railroads serving only one purpose which is to turn cut journals on plain bearing axles. Many of these machines are worn out, obsolete and should be retired. The quality of work produced on such equipment often does not meet minimum requirements of accuracy required by the A. A. R. and the output is low resulting in high unit costs. If better performance is to be expected from the plain bearing and if this type of bearing is to continue in freight service, it will ultimately be necessary to replace such lathes with modern machinery. With roller bearings, such lathes would have no utility and both the equipment and supporting facilities could be eliminated. Even now there is an increasing trend toward the centralization of wheel and axle work as a means of improving quality, production, and making economic savings so that the use of roller bearings will expedite this movement.

Furthermore, there are hundreds of these lathes operating at outlying points which do not have equipment for making the required magnetic particle inspection of plain bearing journals. It will eventually be necessary to purchase such equipment. Still many other outlying shops may have the magnetic equipment, but do not perform the test or are using inefficient methods. With the use of roller bearings there would be no need for this magnetic equipment at outlying points, but only in centralized shops where efficient inspection methods could be better maintained.

The scope of this report does not permit a detail survey of the costs and credits involved in providing new facilities and abolishing existing ones. It is believed that roller bearings would greatly reduce present expenditures and ultimate investment in facilities.

TABLE 9—ESTIMATED INVESTMENT FOR ROLLER BEARINGS ON ALL FREIGHT CARS OF CLASS I RAILROADS

		Capacity car — tons			
		40	50	70	Total
Number of cars		200,000	1,407,000	400,000	2,007,000
Existing cars converted in railroad or private line shops	Number cars	100,000	680,500 (a)	200,000	980,500
	Cost per car, dollars	516	543	585	....
	Total cost, dollars	51,600,000	369,511,500	117,000,000	538,111,500
New cars built in railroad and private line shops (b)	Number cars	30,000	211,000	60,000	301,000
	Cost per car, dollars	393	420	462	....
	Total cost, dollars	11,790,000	88,620,000	27,720,000	128,130,000
New cars built at car builders' shops (c)	Number cars	70,000	492,500	140,000	702,500
	Cost per car, dollars	473	500	542	....
	Total cost, dollars	33,110,000	246,250,000	75,880,000	355,240,000
Grand total cost, dollars		96,500,000	704,381,500	220,600,000	1,021,481,500
Reduced capitalization for:	Cars (Fig. 20)			114,965,000	
	Locomotives (Fig. 19)			35,100,000	
					150,065,000
Net increased capitalization					$871,416,500
Annual savings (d)			(6.4931 × 34,719,917) =	$225,439,891	
4 percent interest				34,856,660	
Net annual savings					$190,583,231
Return on investment after interest, percent					21.87
Number of years required to recover initial investment					4.57

(a) This figure includes deduction 23,000 cars not necessary per Fig. 20.
(b) This number of cars is about 30 per cent of new cars built with 70 per cent constructed by car builders which is in accordanace with current statistics.
(c) Figures used here are not quotations from builders and are only arbitrarily asumed values.
(d) Savings per 1,000 car miles (Fig. 18) × yearly mileage ÷ 1000 (Appendix, Item 1).

TABLE 10—MATERIAL USED TO REPAIR PLAIN BEARING SERVICE FAILURES

		Packing (a)	Bearing (b)	Dust guard (c)	Flame depressant	Total
Hot Boxes On Car Setoffs						
Cut journal, 1st axle	Number used	5	2½	2	1.5#	.....
	Unit cost	0.35	2.87	0.19	0.192	.....
	Total cost	1.75	7.175	0.38	0.288	9.593
2nd axle, same car	Number used	3	2½	2	1.5#	.....
	Unit cost	0.35	2.87	0.19	0.192	.....
	Total cost	1.05	7.175	0.38	0.288	8.893
Rebrass to repair track	Number used	2	1½	....	1.5#	.....
	Unit cost	0.35	2.87	....	0.192	.....
	Total cost	0.70	4.305	....	0.288	5.293
R. & R. to repair track	Number used	2	1	....	1.5#	.....
	Unit cost	0.35	2.87	....	0.192	.....
	Total cost	0.70	2.87	....	0.288	3.858
Road rebrass	Number used	1	1	....	1.5#	.....
	Unit cost	0.35	2.87	....	0.192	.....
	Total cost	0.35	2.87	....	0.288	3.508
Hot Boxes Other Than Setoffs						
Cut journal, 1st axle	Number used	4	2	2	....	.....
	Unit cost	0.35	2.87	0.19	....	.....
	Total cost	1.40	5.74	0.38	....	7.52
2nd axle, same car	Number used	2	2	2	....	.....
	Unit cost	0.35	2.87	0.19	....	.....
	Total cost	0.70	5.74	0.38	....	6.82
Rebrass	Number used	1	1	....	....	.....
	Unit cost	0.35	2.87	....	....	.....
	Total cost	0.35	2.87	....	....	3.22
R. & R.	Number used	1	1	....	....	.....
	Unit cost	0.35	2.87	....	....	.....
	Total cost	0.35	2.87	....	....	3.22

(a) Number journals packed at 10# packing per journal.
(b) Bearing cost—AAR Code Rule 101, Item 162D.
(c) Dust guard cost—AAR Code Rule 101, Item 163.

Investment

An estimate was made as to the capital investment required to apply roller bearings on all freight cars, Table 9. It was assumed that one-half of all the cars were roller bearing equipped when the cars were built and the other one-half of the total cars were converted from plain bearings to roller bearings. The unit costs shown in Table 9 were taken from Table 6 with an amount added to take care of estimated shipping charges.

After 4 per cent interest is charged on the net capital investment of $871,416,500 a 21.87 per cent return is obtained. At this rate, the initial investment would be recovered in 4.57 years.

Depreciation charges were acknowledged in the costs of maintenance by replacing 3 per cent of the bearings at time of wheel renewal as would be indicated at time of bearing inspection. An additional charge of $5.00 per journal box for replacement of other parts at this same time was also calculated as shown in the appendix, item 17g.

A dollar appraisal cannot readily be placed on all the merits of roller bearings and some of these advantages, not already so evaluated, are briefly enumerated as follows:

1. Little shipper dissatisfaction through car delays because of loaded cars set off for hot boxes or delay to other trains.
2. Permits faster train acceleration and higher maximum train speeds and unaffected by extreme cold or hot weather.
3. Large reduction in the number of train stops and delays on the road and in terminals for bearing conditions, which will allow better train schedule operation and train meets.
4. Reduced lading and car damage due to free slack action in the car couplings.
5. Obsolete outlying maintenance points and centralize wheel and axle shops.
6. Reduced switching costs of cars to the repair track for plain bearing journal work.
7. More uniform operation of roller bearing cars in classification and hump yards because the frictional characteristics are more uniform under temperature and loading variables.

APPENDIX

Basic Values Used in Cost Analysis

		Reference
1. Car Miles		
July, 1950 through June, 1951	34,719,916,640	A.A.R. Freight car hot-box record.
Year 1950		I.C.C. Statement No. M-211 (OS-A).
Loaded and empty	29,772,385,000	Item 4-09.
Caboose	518,719,000	Item 4-10.
	30,291,104,000	
2. Train Miles, 1950	514,880,141	Item 2-05.
3. Cars per Train (Average)	60	$\frac{30{,}291{,}104{,}000}{514{,}880{,}141} = 58.8$, say 60
4. Hot Boxes and Defective Bearings, Service Failures:		
(A) Plain bearing, Number of Cars:		
a. Total number	694,400	Average of one every 50,000 car miles[1].
b. Number set off	193,800	A.A.R. Freight-car hot-box record July, 1950 through June, 1951 = 193,758.
c. Other than set offs	500,600	a − b = 500,642[1].
d. Set offs rebrassed	29,000	15 per cent of b = 29,063[1].
e. Set offs to repair track	164,800	85 per cent of b = 164,694[1].
(B) Roller bearing:		
a. Total number	2,315	One per 15,000,000 car miles[2].
b. Number set offs	770	⅓ of a } See Note 2
c. Other than set offs	1,545	⅔ of a } See Note 2
d. Set offs, road change	260	⅓ of b } See Note 2
e. Set offs, to repair track	510	⅔ of b } See Note 2
5. Train-Hour Value (Comprises "out-of-pocket" train hour costs + locomotive depreciation and payroll taxes but not interest on locomotive investment.)	$ 35.00	Signal Section, Advance Notice, A.A.R. Vol. 47, No. 1, 1949, page 51 gives composite average for 1948 of $33.16. Assumed increased costs for 1950 would give $35.00.
6. Car Value:	Revenue capacity per day, all cars	
a. Charge per day	$10.00	Average revenue on serviceable cars for 1950 was $11.59[3]. I.C.C. No. 29587, page 5, states the ratio of active cars to cars owned = 86.15 per cent for 10-year period 1936 to 1945. 86.15 per cent × 11.59 = 9.9848, say $10.00.
b. Charge per hour	0.0416	
c. Cost of one hour delay to train (60 cars)	25.00	
7. Number cars on Class I Railways	1,744,625	See Note 3.
8. Total Number Cars, Including Private Cars in Interchange	2,007,608	Item 7 + 262,983. See Note 3.
9. Average Train Delay Due to Set Offs, hr.	1	Average delay setting off and picking up car[1].
10. Average Car Days Lost Due to Bearing Road Failures:		
a. Car set offs, except road change	4	See Note 1
b. Car set offs, given road change	2	See Note 1
c. Other than set offs	3	See Note 1

Calculations in Cost Analysis

11. Cost of Locomotive Delay Due to Set Offs:
    Plain bearing: 193800 hot boxes × 1 hour delay × $35.00 (4b, 9, 5)[4] = ... $ 6,783,000
    Roller bearing: 770 hot boxes × 1 hour delay × $35.00 (4b, 9, 5)[4] = ... $ 26,950
12. Cost of Car Delays in Trains Due to Set Offs:
    Plain bearing: 193,800 × $25.00 (6c, 4b) = $ 4,845,000
    Roller bearing: 770 × $25.00 (6c, 4b)[4] = $ 19,250
13. Cost of Car Days Lost on Set Offs and Repair Track: (See Table)

Cost of Car Days Lost on Set Offs and Repair Track

	No. days delay	No. Cases: Plain Bearing	No. Cases: Roller Bearing	Total days delay: Plain Bearing	Total days delay: Roller Bearing
Set offs given road change (10b)	2	29,000	260	58,000	520
Set offs, except road change (10a)	4	164,800	510	659,200	2,040
Other than set offs (10c)	3	500,600	1,545	1,501,800	4,635
Total days delay	..	......	....	2,219,000	7,195
Total cost: Days delay × $10.00 (6a) =	..	......	....	$22,190,000	$71,950

[1] Based on detail study made on two Class I railroads.
[2] Based on experience with Timken bearings on freight and passenger cars and locomotives.
[3] Statistics Car Building & Car Repairing; American Railway Car Institute, 1950.
[4] Bracketed numbers refer to items in appendix.
[5] For summary and total costs see Tables 3, 4 and 5.
[6] For detail costs on plain bearing material see Table 10.

14. Cost of Labor and Material on Set Offs and Repair Track:
    Plain bearings $14,868,801
    Roller bearings .... $ 167,513

Unit Costs[5]

LABOR AND MATERIAL TO REPAIR ROLLER BEARING SERVICE FAILURES:

(A) At point of set off:

	Road change	Set offs to repair track
50 miles truck @ 8 cents	$4.00	$4.00
24 man-hours @ $3.15	75.60	......
4 man-hours @ $3.15	.....	12.60
Total	$79.60	$16.60

(B) At repair track:

Set offs: Road change, 6 man-hours @ $3.15 =	$18.90
Set offs to repair track or other than set offs, $15.75 (Item 14C (1) plus 3 man-hours @ $3.15 =	$25.90
Material for all service failures:	
Bearing	$31.36
Grease	.90
	$32.26

LABOR TO REPAIR PLAIN BEARING SERVICE FAILURES—A.A.R. CODE RULE 107[b]:

(C) Cut journals, replacing axle at repair track:
    (1) First axle: Item 165 — note under

APPENDIX

Calculations in Cost Analysis *(Continued)*

item 168 + item 83 × item 92 (5.2 hours − 1.2 hours + 1.0 hour) × $3.15 = ... $15.75

(2) Second Axle: Assuming it occurs 50 per cent time in same truck as first cut journal and 50 per cent time on other truck:

$$\frac{\$1.75 + (\text{items } 167 - 168) \times \text{Item } 92}{2}$$

$$\frac{15.75 + (2.6 \text{ hours} - 1.2 \text{ hours}) \times \$3.15}{2}$$

= $10.08

(D) Rebrass or R. & R. at repair track − item 89 × item 92 ½ hour × $3.15 = $1.575

(E) Repairs at point of set off (average case):
50 miles truck @ 8 cents = ... $ 4.00
4 man-hours labor @ $3.15 = ... 12.60

Total $16.60

15. Cost of Accidents Due to Broken Journals (Fig. 10):
Total number 833; average delay, 12 hours; total delay, 10,000 hours.
(A) Damage to equipment, $2,439,267; to tracks, $1,506,676; clearing wrecks, $645,872. Total .... $ 4,591,815
(B) Locomotive delay, 10,000 × $35.00 (5) $ 350,000
(C) Car delay in train 10,000 × $25.00 (6c) $ 250,000
(D) Damage to lading, detouring trains, delay to other trains assume 15 per cent of (A) or .... $ 688,722

Total cost, 1950, $5,880,587 or 19.414 cents per 1,000 car miles.
Total cost calculated for 1950–1951 mileage (1) .... $ 6,740,525
One roller bearing accident per 3 billion car miles:

$$\frac{34{,}719{,}916{,}640}{3{,}000{,}000{,}000} = 11.57 \text{ or } \frac{11.57}{833} \text{ of the}$$

cost of a plain bearing accident, total cost $ 94,367

16. Cost of Fires Due to Overheated Journals (Fig. 16):
330 fires, $483,132, or 1.59 cents per 1,000 car miles for 1950. Cost calculated for 1950–1951 mileage (1) .... $ 552,047

17. Cost of Maintenance, Rule 66 and Routine Inspection:

Plain Bearing

(A) Oil, 3 pints per 1,000 car miles: 34,719,917 × ⅜ = 13,019,969 gals. Total cost at 31 cents per gal 4,036,190
(B) Packing, 9 lb. per 1,000 car miles: 34,719,917 × 9 lb. × 3.5 cents per lb. is $10,936,774 which includes $755,020 cost of road failure (14). Total cost rule 66 and routine inspection $10,181,754
(C) Labor: 4,145,555 days × 8 hrs. × 2.326[7] $77,140,487
(D) Car days lost due to repack rule 66: 2,007,608 (8) × 1½ (average repack per year) = 3,011,412 cars repacked. 3,011,412 × 0.6 (car sent to repair track for repack) = 1,806,847 cars. 1,806,847 × 2 days delay = 3,613,694 days lost × $10.00 (6a) $36,136,940
(E) Other material:
Brasses $12,953,916
Dust guards .... $ 398,519
Flame depressant .... $ 5,210
Box lids .... $ 2,090,486
Wedges .... $ 89,057
Axles .... $ 2,122,428

Roller Bearing

(F) Grease:
1. At inspection:
Inspection once in 3 years. ⅓ of 2,007,608 cars (8) × 8 boxes per car = 5,353,624 boxes. 1 lb. × 5,353,624 × 18 cents = ... $ 963,652
2. At wheel renewal:

$$\frac{34{,}719{,}916{,}640 \ (1)}{150{,}000 \text{ wheel life}} \times 4 \text{ pairs per}$$

car = 925,864 pairs renewed. 925,864 × 2 = 1,851,728 boxes. 2½ lb. × 1,851,728 × 18 cents = ... $ 833,278
3. At wheel turning:

$$\frac{34{,}719{,}916{,}640}{25{,}000} = 1{,}388{,}800 \text{ pairs}$$

requiring turning. 1,388,800 − 925,864 pairs renewed = 462,936 pairs turned. 2 lb. × 462,936 × 18 cents = $166,657. Total costs (1 + 2 + 3 = ... $ 1,963,587

(G) Material:
1. Bearings:
2,007,608 (8) × 16 per car = 32,121,728. Assume 3 per cent replacement, 963,652, less road failures, 4,630 = 959,022. 959,022 bearings × $15.68 per bearing = $15,037,465
2. Miscellaneous:
963,652 ÷ 2 = 481,826 journal sets. 481,826 × $5.00 = ... $ 2,409,130
3. Axles:
⅔ of 2,315 service failures × $51.50 = ... $ 78,847

(H) Labor:
1. At inspection (Rule 66):
12 minutes or ⅕ hr. 669,203 cars × ⅕ × $2.326[7] = $311,313
2. At wheel renewal:
925,864 pairs × 3 hrs. × $3.15 = $8,749,415.
Total 1 + 2 = ... $ 9,060,728

18. Other Savings:
(A) Roller bearings will eliminate turning journals on wheel defects 1,388,800 defective wheels × ½ hr. per pair × $3.15 = ... $ 2,187,360
(B) Quick wheel change saving, 0.9 hr. per pair, Rule 107, item 165-166. Assume ½ wheels are quick change. 1,388,800 × ½ × 0.9 × $3.15 = ... $ 1,968,624
(C) Car days lost on inspection enroute: Inspection time per car. 320 seconds plain bearing less 30 seconds roller bearings is 290 seconds saving per car.

$$\frac{290 \times 60 \text{ cars } (3)}{3{,}600 \text{ seconds}} = 4{,}833 \text{ hrs.} + 4 \text{ men}$$

= 1.2 hrs. saving per train

$$\frac{514{,}800{,}141 \ (2)}{2} = 257{,}440{,}070 \text{ train}$$

miles inspections made assuming ½ of trains need no intermediate inspection. 257,440,070 ÷ 375 miles between inspection = 686,500 inspections made.

$$\frac{686{,}500 \times 60 \text{ cars } (3) \times 1.2 \text{ train hour saved}}{24 \text{ hours}} = 2{,}059{,}500 \text{ days}$$

saved. 2,059,500 × $10.00 = ... $20,595,000
(D) Locomotive delays due to inspection, 686,500 inspection × 1.2 hrs. × $35.00 (5) = ... $28,833,000

[7] Freight car lub. rate = $\dfrac{\text{Pass. Lub. rate} \times \text{Frt. car repair rate}}{\text{Pass. Car Repair Rate}}$ = $\dfrac{\text{PC rule 21 item 19} \times \text{rule 107 item 92}}{\text{PC rule 21 item 20}}$

Waste Packed Journals*

Lack of confidence in low-viscosity high-film-strength oils is responsible for the opinion waste packing is becoming obsolete

By L. D. Grisbaum†

In August, 1950, the Association of American Railroads issued specifications for both new and renovated journal box lubricating materials to become effective as of January 1, 1951. The urgency for the new specifications and the short time available for their preparation precluded the possibility of utilizing fully the data resulting from the comprehensive studies of car oil and journal box waste carried out by the Association at the Indianapolis Lubrication Laboratory which resulted in something far short of an optimum specification. In spite of this, it has been most valuable from a psychological standpoint and has resulted generally in a better and more uniform material from a functional standpoint. Because they are intended as interim specifications and will be in service for a short time only, it is difficult to evaluate the lubrication benefits, if any, that can be credited directly to them. It is certain, however, that reducing the current specifications to practice was a step in the right direction; as from this beginning is already emerging specifications for car oils whose behavior in service, rather than personal opinions, is dictating the physical dimensions of the oils.

During the past five years there has been a noticeable decrease in the car miles per hot journal on freight train cars and the tendency of the curve continues sharply downward. Every mechanical railroad man may well ask and give some serious thought to two questions: Is his pool of journal box packing of sufficient quality efficiently and economically to lubricate his journals; and. if not, what are the potential possibilities of journal box packing as an economic and efficient lubricant? The answer to the first question is obviously a matter of studying and comparing his records of operation and his direct and indirect cost of lubrication. The answer to the second question is less obvious and is the basis of this paper.

There is much experimental evidence both from the laboratory and the railroad definitely to indicate that from a technological standpoint the lubrication efficiency and economy of journal box packing can be greatly improved. Whether or not the potential possibilities are ever obtained depends to a large extent on the willingness of the railroads to rationalize their respective views on the psychological phase of the problem. There are no fundamental differences between the railroads in the lubrication of conventional car journal bearings; the problems are identical and the theoretical approach should not differ. Why then are the answers to the problem and the practices of car journal lubrication so varied that they can only be given in paradoxical and qualified terms? The operating results are no better or worse than the dominant opinion responsible for the lubrication practice on any railroad; and, because of interchange, the ultimate results of this opinion are felt through the country.

From the earliest days the waste pack lubricator has been the standard method of journal bearing lubrication. It was a relatively simple operation to change a liquid oil to a solid state by saturating it into a fibrous material that would not only feed oil to the bearing in excess of that necessary to support film lubrication, but would retain the oil in the box and in a position to lubricatae the journal. When we think of solid or semi-solid lubricants, we presuppose oils that have been thickened with metallic soaps or fatty acids. The mechanics of a waste pack lubricator is similar to that of grease lubrication. As the mobility and activity of the oils in either case are decreased, more work is required to get the lubricants to the journal and more heat is generated in film shear. On this broad premise the practice of using heavy oil for summer operation and lighter oil for winter operation is not only bad lubrication engineering, but bad functionally because car oils are not changed in journal boxes on a seasonal basis. The lack of an all-season oil or perhaps, more recently, the lack of confidence in the relatively low-viscosity, high-film-strength oils available and necessary to satisfy the many lubrication and functional requirements of an all-season car oil is responsible in a large measure for the growing opinion that the waste pack lubricator is hovering in the shadows of obsolescence. Through the years there have been many attempts made to find ways of replacing the packing in journal boxes, but little serious effort fully to understand the mechanics of the waste pack lubricators and its potentials. We have operated with fluctuating fortunes but never with a sustained satisfactory year-round performance. Perhaps lack of universal progress in elevating the efficiency of the waste lubricator was at least partly due to the fact that bearing failures during the months of favorable atmospheric conditions were within a reasonable expectancy, while the peaks in the failure curve were accepted as the natural result of inherent conditions due to extremes in atmospheric temperature and climatic conditions. All packing was grist to the mill; and with the possible exception of the special materials reserved for on-line equipment, little attention was paid to quality and less known about its lubricating value. In spite of which, when considering the large number of journal boxes in daily operation, actual failures (if we charge all hot boxes to lubrication) are relatively few.

When heat is generated in a journal box at a faster rate than it can be dissipated, a bearing failure occurs. The sources of heat are the bearing and packing friction both of which are subject to a measure of control. The starting point to improvement in packing lubrication

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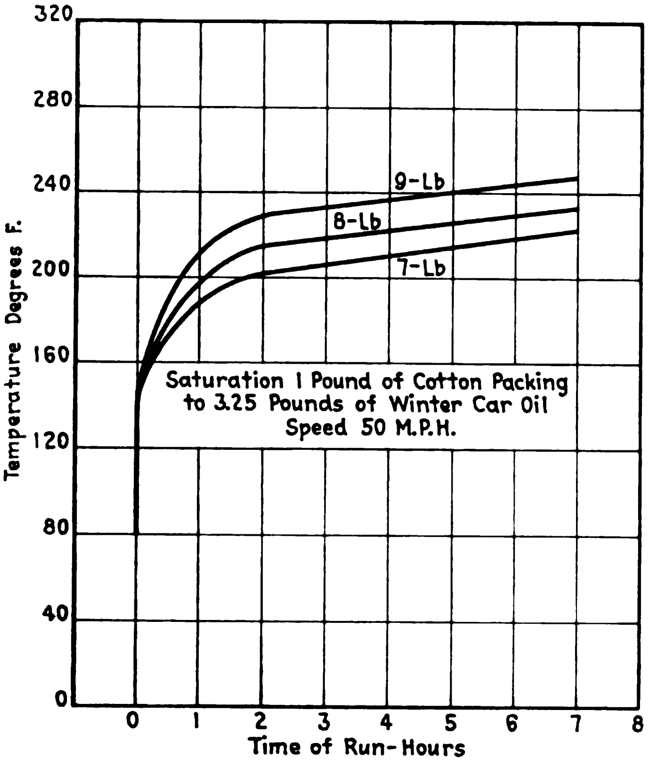


Fig. 1—Influence of various amounts of packing upon operating temperature

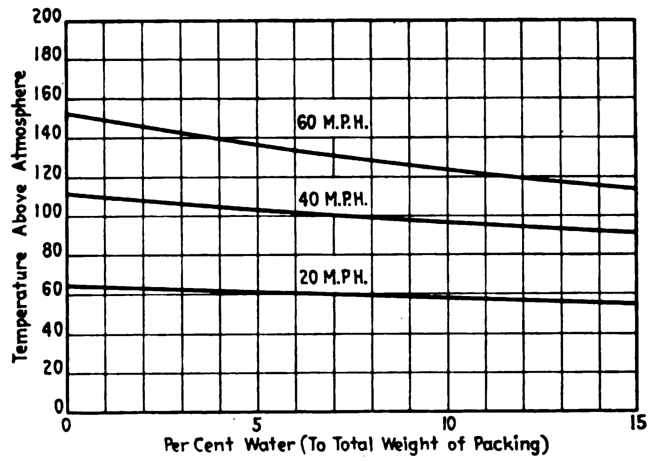


Fig. 2—Effect of increasing water content of journal-box packing upon operating temperatures, 20,000-lb. journal load

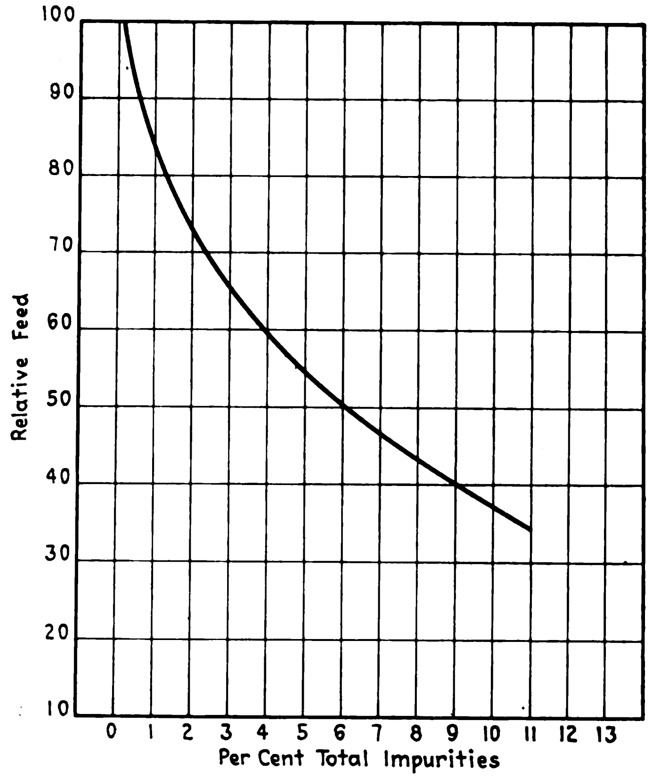


Fig. 3—Decrease in oil fed to bearing as dirt in packing increases

lies in reducing to a minimum the temperature generated under maximum operating conditions of load, speed, and under extremes of atmospheric temperature to a point where the thermal gradient between the oil film and the box roof will dissipate the heat as rapidly as it is generated. The lower this stabilized temperature can be maintained, the higher the lubricating factor of safety.

Under laboratory procedure and with current specification materials, fully half the heat generated in a journal box is caused by the friction of the packing against the journal which, while being difficult to control, can be minimized by mechanical improvements in the correlated parts of the journal box and more careful attention to packing and servicing the boxes. The principal items in this category are—

(a) Excess packing in the box (Fig. 1); (b) Increase in packing resilience due to evaporation of moisture during periods of high atmospheric temperature (Fig. 2); (c) Increase in adhesiveness during periods of low atmospheric temperature, and (d) The reduction of oil feed and increased friction with the build up in extraneous materials in the packing (Fig 3).

The two principal controllable factors that influence packing friction are the viscosity of the oil and the type and kind of threads in the packing waste. The low viscous oils not only produce less packing friction, but carry less extraneous matter, including lint, to the bearing: reduces or prevents rolling of the packing; and feeds more oil to the journal.

There is an optimum relationship between the gauge of the threads in the packing waste and the ratio of oil saturation which is directly influenced by the viscosity of the oil. It is possible to control rolling of packing in the journal box due to the friction of the packing on the journal by reducing the ratio of oil to waste as the gauge of the thread decreases. In a wellfitted journal box containing packing saturated with the usual ratio of 3½ parts of oil to 1 part of waste, the oil lost from the journal box in the first 50 miles of travel will vary between 15 and 20 per cent after which little, if any, further loss occurs. It so happens that the resultant or stabilized saturation of from 2.75 or 3.00 to 1 appears to coincide with the best saturation ratio to prevent packing displacement in the journal box with oils within the viscosity range of specification EM 906-50 (50 to 55 sec. at 201 deg. F.) when used with the extremely fine threads currently being furnished as packing waste. As the viscosity of the oil is lowered from a 50-second range to 40 seconds the saturation of the packing can again be increased without undue packing displacement.

It is also possible in the laboratory under both extremes of ambient temperature to control packing displacement in the box by elevating the temperature of the packing by extending the preliminary or orientation run before testing, thereby lowering the viscosity of the

oil to a point where the forces of adhesion of the oil is less than the force of gravity, in which case there is not sufficient oil on the surface of the packing in juxtaposition to the journal to cause the packing to roll. Since oil in excess of fiber saturation is held in the packing by the viscosity of the oil and surface tension, temperature in excess of ambient is necessary to reduce saturation of the packing at the journal surface to a point where the journal is barely wetted with oil and its adhesiveness is, therefore, reduced to the point of impotency. If all boxes requiring servicing could be tooled while still at running heat, this natural phenomena would work to advantage. However, the necessity to tool packing when the journal box assembly is at or about ambient temperature, squeezes the oil to the surface of the packing where it remains in excess amounts; and, when the journal is put in motion, any oil pooled on the top of the packing will rise on the journal carrying the loose extraneous materials to the bearing. The heavy layer of oil between the packing and journal being under pressure is subject to shear and the higher its resistance to the movement of the journal, the greater the degree of packing displacement. Since boxes are packed and serviced under many temperature conditions which cannot be controlled, improvement in packing displacement must again depend on the lubricant. It is fortunate that the rate of migration of the oil through the waste can be controlled by the simple expedient of reducing its viscosity.

In addition to the waste pack being a means of self lubricating the journal, it possesses all the characteristics of a good oil filter. Like all filters of this type, as the extraneous matter builds up in the fiber of the waste and the filter becomes more efficient, the waste pack, as a lubricator, becomes less efficient with reduced oil feed to the journal. The lighter the oil the less filterable material carried with it on its way to the journal, and the greater the rate of oil fed to the bearing. This again indicates that low viscosity car oil is beneficial in waste packing. Because the waste pack is a filter, any practice or device that interferes with tooling the packing which is necessary to disperse the filter cake accumulated at the surface of the packing will eventually result in starved lubrication and an increase in failures.

Car Journal Oil

It is most fortunate that the axle load limits of railroad train cars are well within the strength capacity of the best bearing metal known. Lead base babbitt is not too fussy about the kind or degree of hardness of the journal, or its contour. It is likewise tolerant of insufficient and dirty oil. The relatively thick babbitt lining together with the soft bronze back makes a readily deforming unit that has the faculty of adapting itself to considerable misalignment and dimensional tolerance. The natural unctuousness of babbitt helps to keep temperatures low; and, if lubricated with an oil of proper viscosity and a high degree of oiliness, will operate with a low co-efficient of static and dynamic friction and pay handsome dividends in greatly improved performance.

In car journal lubrication, like any high grade lubricating job, the two more important characteristics of the lubricant are:

(1) The proper viscosity of the oil at the operating temperatures and pressures where lubrication is in the region of fluid film: (2) Oiliness where lubrication is in the boundary film region, and (3) Mentioned last for emphasis, because it is most important that car oils have viscosity characteristics that will assure optimum functional behavior with waste, as set forth in the preceding section of the papers. Any improvement, therefore, in the economy and efficiency of the waste pack lubricator must be based on the premise that the oil must satisfy the lubricating requirements of the bearing with a generous factor of lubrication safety (anything in excess of this is a waste of energy with more heat to dissipate), as well as the complex functional requirements that waste imposes on journal lubrication. After establishing the entity of this new kind of car oil by fixing its physical measurements from performance behavior, it not only must be readily available as new car oil, but the present pool of oil after being renovated must be converted by blending and medication to identical specifications and performance.

Under A.A.R. Specification E. M. 906-39 for new car oil, in force until January 1, 1951, it was possible to select an oil having a viscosity from 45 to 118 Saybolt Universal seconds (S.U.S.) at 210 deg. F. depending on the viscosity index of the oil, the only limitation being a maximum viscosity at 100 deg. F. of 725 seconds. The current specifications for both new and renovated oil materially narrows the viscosity spread to 50-55 seconds at 210 deg. F. and sets the limit at 100 deg. F. by providing for a minimum viscosity index of 80. This is a considerable improvement and a decided step in the right direction.

While good viscosity temperature characteristics are an important property of a quality lubricant and a high viscosity index is a desirable characteristic in a car oil, of far greater importance is its ability to maintain full fluid film lubrication and to support heavy loads at relatively high temperatures under boundary lubrication with a considerable lower viscosity oil than is provided for in the current specifications. While the opinion still prevails in many places that even heavier oils are necessary to avoid film rupture under heavy loads and high ambient temperature. Its continued use imposes the penalty of higher total friction, and operating temperatures; and. therefore, more border line cases of insipient fevered bearings. By the use of oiliness or film forming improvers, it is possible to combine low internal friction, low packing journal friction, and low viscosity with high resistance to film failure and thereby more closely approach optimum lubrication over the entire range of car journal operation with one oil for all-year use.

In the preparation of the current A.A.R. car oil specifications it was attempted to make an all-season oil from one of relatively high viscosity by lowering the pour point by artificial means. Since pour point is a physical dimension that has no influence on the lubricating value of a car oil, it apparently was the thought that a low pour point would improve the mobility of the oil in the waste and thereby eliminate or decrease the difficulties caused by high retention and adhesiveness during periods of low atmospheric temperature. As already pointed out, viscosity and surface tension are the two characteristics of the oil that affect its retention in the waste above fiber saturation. While the laboratory work has not been completed on the influence that oils medicated with pour point depressants have on their behavior with waste, it appears from the work done and substantiated by the records of bearing heatings since the specifications became effective that the use of depressant additives has materially increased rather than decreased the adhesive powers of the oil and is a factor in the appreciable increase in bearing failures.

To evaluate the overall lubricator and lubrication efficiency of E.M. 906-50 specification car oils, samples submitted by all the major oil companies were tested in the Indianapolis laboratory by the Association of American

Railroads. The results of most of the oils tested in this group are in good agreement.

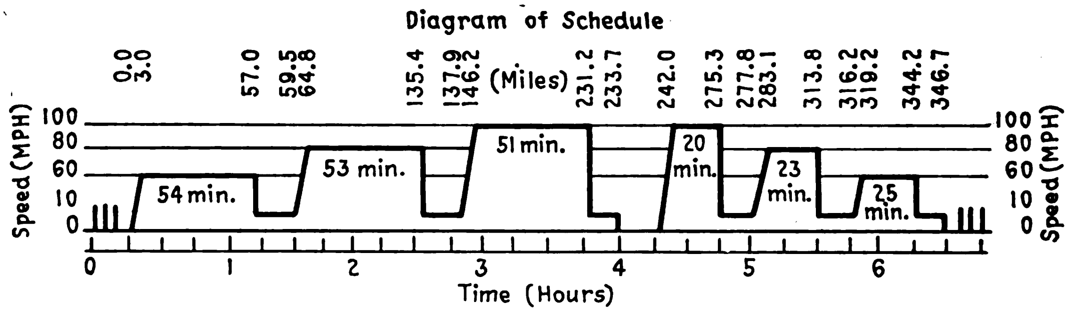
A comparison of the total energy consumed to complete two test cycles for both the sub-zero and high temperature tests for each oil shows an average ratio for the three oils in each group of 14.13 to 19.00 hp. hr. favorable to the light oils for the low temperature tests and 8.37 to 13.03 hp. hr. respectfully for the high temperature tests. Car oils in the current specification range have an uneconomic excess viscosity that is responsible for an unnecessary energy loss of approximately 25 per cent. The heat equivalent to this excess energy is reflected in the greatly elevated journal temperature. For the sub-zero tests the low viscous oils averaged for the three tests at all speeds 68 deg. F. lower journal temperatures than the specification oils, and for the high temperature tests the journal's average was 64 deg. F. below the average temperature of the three heavier oils.

The peaks in hot box curves occur during extremes in atmospheric temperature and in most sections of the country in the summer months. The experimental evidence presented indicates that the practice of using heavy oils in summer to provide a thicker film, and supposedly better lubrication is in reality a direct influence on the high ratio of failures during the hot months. Bearing temperatures are within a range of 10 to 20 deg. for a given oil under like operating conditions regardless of the ambient temperature; that is, a waste packed journal operating in an atmosphere of 100 deg. F. will have a temperature at the end of any operating cycle of only 15 deg. F. higher than when operating in an atmosphere of minus 15 deg. F. Lighter oils are as essential for summer operation as during the colder weather if we are to flatten the peaks and further depress the valleys of the hot box curve.

The question most frequently raised in opposition to lower viscosity car oil is its ability to lubricate satisfactorily in high atmospheric temperatures. However, tests were made of two samples of blended and compounded renovated car oil. The specification oil consists of 90 per cent renovated oil, 10 per cent neutral blending oil, and 0.2 per cent of a pour point depressant. The low viscosity sample contained 50 per cent of the renovated oil, 50 per cent of the neutral blending stock, and 0.5 per cent of an E. P. (extreme pressure) or oiliness additive. The specification oil had viscosity values of 52.1 S. U. S. (Saybolt Universal Seconds) at 210 deg. F. and 301 S. U. S. at 100 deg. F., the low viscous oil, 41.6 S. U. S.

TABLE NO. 1—COMPARATIVE TEST RESULTS OF SIX CAR OILS

5½-in. by 10-in. journal — Speeds—Distance for 36-in. wheel — Journal load—16.375 lb.
Standard A.A.R. babbitt lined bearing broached 5.53125 in. diameter. — Diametrical Clearance .03125
Waste lubricator—All cotton packing waste — Saturation 3½ parts of oil to one part of waste
Oils—Three low viscosity high film strength — Three specification EM 906-50



	+No. 1 Cold	Hot	+No. 2 Cold	Hot	+No. 3 Cold	Hot	+No. 4 Cold	Hot	+No. 5 Cold	Hot	+No. 6 Cold	Hot
Viscosity in Saybolt seconds, deg. F.:												
100	191		310		146		316		128		301	
210	46		53		42		53		42		52	
Average ambient temperature, deg. F.:												
Minimum	−21	99	−30	99	−21	99	−29	99	−31	100	−31	99
Maximum	−12	101	−18	101	−11	101	−15	101	−20	101	−16	101
Total energy consumed two runs hp. hrs	13.8	8.9	20.6	13.6	14.9	9.7	18.4	13.0	13.7	6.5	18.0	12.5
Average journal temperature end, m.p.h.:												
60	203	217	259	266	215	223	265	276	180	196	244	259
80	230	246	291	302	237	252	299	318	211	223	294	296
100	253	268	318	332	259	274	332	349	232	243	324	329
Maximum journal temperature	269	287	367	354	270	291	352	367	250	258	352	352
Average journal temperature rise end, m.p.h.:												
60	219	117	282	166	230	124	285	117	204	95	266	160
80	244	146	311	201	251	152	317	218	235	182	313	196
100	267	167	337	231	271	173	349	250	234	143	341	229
Maximum journal temperature rise	283	175	386	254	282	190	369	267	272	158	369	250
Average lubricator temperature end, m.p.h.:												
60	132	197	74	167	117	171	65	159	40	162	103	176
80	160	216	108	169	161	204	87	176	59	181	135	199
100	185	250	126	176	179	220	97	186	71	189	141	210
Average resistance lbs./ton DBP end, m.p.h.:												
60	0.87	0.58	1.19	0.81	0.91	0.60	1.10	0.70	0.78	0.41	1.02	0.71
80	0.78	0.54	1.03	0.74	0.80	0.56	0.98	0.73	0.70	0.40	0.92	0.59
100	0.72	0.53	0.96	0.72	0.76	0.57	0.93	0.65	0.65	0.41	0.89	0.66
10	1.64	0.96	2.35	1.99	2.52	1.89	2.83	1.30	0.74	0.23	2.20	1.25
Average temperature:												
Spread bearing and journal	10	4	15	7	7	2	13	5	14	5	10	5
Spread bearing and packing	91	50	160	105	86	54	200	119	80	45	146	80
Spread bearing and box roof	60	20	109	66	78	50	123	74	136	38	119	66
Average starting resistance before test	21	41	33	53	24	39	43	61	31	46	34	66
Average starting resistance after test	61	60	65	72	38	45	84	80	38	46	83	80

+No. 1 Standard Oil of New Jersey, No. W. S. 1543 Oil.
+No. 2 Standard Oil of New Jersey, Esso No. 2046.
+No. 3 Sinclair Alweather No. 313 Car Oil.
+No. 4 Sinclair SINCO Car Oil No. 53.
+No. 5 Railroad Service & Supply Corp., Low Viscosity Renovated Oil.
+No. 6 Railroad Service & Supply Corp., Specification EM 904-50 Oil.

at 210 deg. F. and 127.8 S. U. S. at 100 deg. F.

Each oil was tested at speeds of 10, 30, 60, 80 and 100 miles per hour for 7 hours of continuous running under 16,375 lb. total load in an atmosphere of 125 deg. F. The test room temperature was maintained during the no-running time (17 hours between each test) to assure maximum mobility of the oil during the quiescent period.

In evaluating the two oils on the basis of the stabilized results of the variable factors established by the tests, the divergents of the bearing temperature curves with increased speed and the corresponding position of the draw bar pull curves, Fig. 4, again indicate that lighter car oil is essential in reducing normal journal temperatures during summer operation. This is further substantiated by the close approximation of the viscosity of the two oils at the higher operating temperature, Fig. 5.

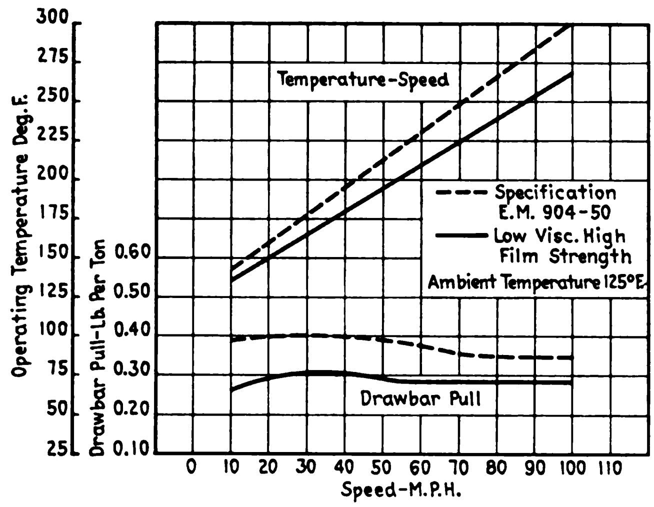


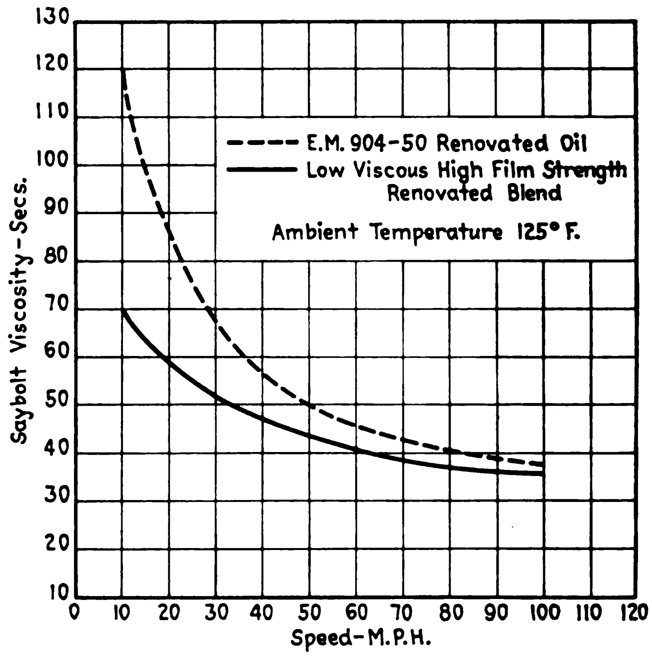
Fig. 4—Operating temperature and draw-bar pull compared with speed. Low viscous, high film strength oil versus EM 904-50 oil

The two bearings used in the tests were machined identical in all vital dimensions. Each has a diametrical clearance of .03125 inches. It is therefore assumed that under static conditions the intimate contact between the bearing and journal was identical. At the end of each test covering a total of 1,960 miles, the effective crown area by planimeter measurements of tracings of the worn areas showed that the bearing used with the light oil had a total area of 18.5 sq. in. while the bearing used with the specification oil had an area of 18.3 sq. in. Since the worn area of both bearings was practically identical, the oil film introduced by rotation of the journal was sufficient with either oil to separate the bearing and the journal and permit running with an identical unit load. If the low viscosity oil were not able to support the load under any of the conditions imposed by the test, wear of the contact area of its bearing would have continued until it was large enough to permit an oil film that would carry the load. Since this did not occur, it adds further assurance to the use of lower viscosity oils in hot weather.

An attempt was made to ascertain the relative factor of lubrication safety of the two oils at the stabilized temperature for the 100-m.p.h. speed by measuring the film strength of the oils on a modified Almen type tester. The light oil had a stabilized journal temperature of 267 deg. F. The corresponding temperature of the heavier oil was 296 deg. F. With the test bearing and journal in place and the cellar filled with the oil to be tested, the assembly was heated on an electric hot plate until it reached 310 deg. F. Due to loss of heat during the test cycle, the final temperature of the light oil at the time of film rupture was 240 deg. F., and the oil failed under a load of 70,000 p.s.i. The final temperature of the heavy oil, due to a shorter test cycle, was 250 deg. F., and the failure occurred under a load of 33,000 p.s.i. From this test it appears that the light oil not only maintains sufficient film thickness to support successful normal bearing operation, but has reserve film strength to resist lubrication failures now caused by over load and low speeds.

Journal Box Packing Waste

In June 1949 five series of tests of packing waste fibers were started at the Indianapolis laboratory in an attempt to evaluate the commercially available threads for its usage value in journal box packing. The work was done on a special four spindle machine, with eight 2¾-in. diameter journals. Various individual type threads, as well as commercial packing waste, were tested and rated on the amount of excess oil fed to the bearing, bearing temperature, oil retention, resilience, tendency to waste and thread grab and rolling.



EM 904-50 Renovated Oil		Low Viscous High Film Strength Renovated Blend	
Viscosity index	94	Viscosity at 100 deg. F.	127.8
Viscosity at 100 deg. F.	301	Viscosity at 210 deg. F.	41.6
Viscosity at 210 deg. F.	52.1	Viscosity index	99

Fig. 5—Oil film viscosity Saybolt Universal Seconds (S.U.S.) of operating temperatures

In the first series of tests conducted to screen various types of materials thirty-one samples of waste and individual threads were studied. The material was divided into sixteen samples of commercial packing waste supplied by various manufacturers of which seven were all cotton; two samples were all wool; and seven samples were miscellaneous mixtures. There were fifteen individual thread types consisting of three types of wool thread, Marino thread, eight different types of cotton thread and three samples of classified rayon thread. In each case the packing was made up of 3½ parts of renovated oil and 1 part of waste.

Of the thirty-one samples studied, all cop cotton thread,

mixed spooler and cop thread, mixed rayon thread and rayon crepe were rejected as unfit for use in journal box packing. The following eight samples were classified as questionable and not recommended for use in packing: Unmachined cotton-warp thread, machined and unmachined cotton spooler thread, machined cotton cop thread, and four samples of commercial cotton packing waste made up predominately of spooler and cop thread. The remaining twelve samples of packing waste and eight samples of classified thread were considered satisfactory for use in journal box packing.

The second group of tests run with seven different packing wastes saturated with renovated oil was made to determine the effect of the natural variance in the ratio of volume to weight of the different packing wastes. As the ratio of volume to weight of packing in the box is decreased, the temperature of the bearing is reduced, the oil fed to the journal decreases, and the other functional characteristics of the packing remain essentially unchanged.

The third series of tests using seven different waste packs were conducted to determine the effect of varying amounts of moisture in the packing. Each waste was tested first, as removed from the bale; second with 10 per cent of additional water; and third oven dried (oven drying resulted in an average moisture loss of 8.2 per cent of the weight of the samples). The oven dried packing produced an average bearing temperature rise of 13 deg. above that obtained with the waste as removed from the bale and the hydrated packing averaged 20 deg. F. below the bearing temperature of the dehydrated packing. The oil fed to the bearing was essentially the same for the waste as received, and the waste to which 10 per cent of water was added; while water drying the waste somewhat lowered the feeding rate.

The fourth series of tests were conducted to determine the behavior characteristics of oils from different sources when saturated into packing waste of widely different thread mix. (Fig. 6 is typical example of three oils in cotton waste.) There were five types of commercial packing waste used including one sample each of all wool; 60 per cent wool, 40 per cent cotton; 30 per cent wool, 35 per cent cotton warp, and 35 per cent fine cotton slasher; 95 per cent cotton thread and 5 per cent cocoa fiber; and a manufactured brand all-cotton packing waste. Each of the above samples was made into a six waste pack lubricators using a different oil for each. Five of the six oils used had a viscosity range of from 52 sec. to 61 sec. Universal Saybolt at 210 deg. F. and the sixth sample was winter car oil with a viscosity of 45 sec. at 210 deg. F. From a standpoint of the waste the results of this study again indicate that resilience is a criterion of bearing temperature rise. The wool and wool mixtures operate with an average temperature differentiation of from 5 deg. to 7 deg. F. above the cotton waste packing, Fig. 7.

From a comparative study of this series of tests it appears that the rate of oil feed to the journal is independent of the initial viscosity of the oil tested, the rate of feed being indirectly influenced by the effect of oil viscosity on operating temperature. It is apparent that in the viscosity range of the oils tested, the other functional characteristics of the packing depend more on the type and condition of the waste than on the oil. The all cotton waste had the highest rate of oil feed and the wool-cotton mixture the lowest, Fig. 7.

The fifth series of tests to compare the functional behavior of straight mineral car oil with oil containing oiliness or film strength additives employed six different samples of packing waste consisting of all wool, all cotton, and composite samples of both materials. Each kind of the above waste was made into six lubricator packs three of which were saturated with non-additive car oils of conventional physical dimensions, and three packs saturated with E.P. additive oils having a lower viscosity range. The comparison of the non-additive oils with the medicated oils, using the average of the six lubricating packs with the six oils, shows that the additive oils operated at a lower temperature, had better feeding ability, and do not as readily carry waste fibers and threads to the bearing.

From the results of the foregoing five series of investigations the following conclusions were made:

1. All types of waste threads and combinations thereof will feed oil to the journal in excess of that necessary to support full fluid film lubrication.

TABLE NO. 2—COMPARATIVE TEST RESULTS OF TWO RENOVATED CAR OILS

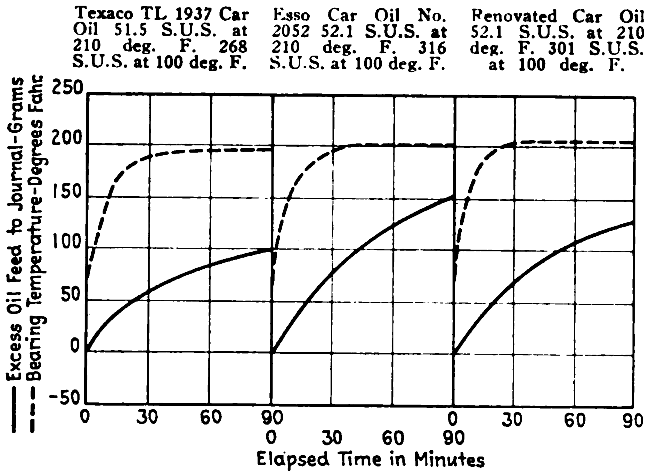
5½-in. by 10-in. Journal. Speed-distance for 36-in. wheel. Journal load, 16,375 lb.
Bearing A.A.R. standard babbitt line broached 5.53125 in. Diameter. Diametrical clearance, .03125 in.
All cotton packing waste. Saturation 3½ parts oil—1 part waste.

Test No. 1—Renovated Car Oil, Low Visc. High Film Strength

	10 m.p.h.	30 m.p.h.	60 m.p.h.	80 m.p.h.	100 m.p.h
Temperature, deg. F.:					
Ambient	126	125	125	125	125
Journal	135	168	216	242	267
Bearing	135	168	215	242	266
Box Roof	131	149	180	197	213
Packing	131	155	188	206	220
Temperature rise, deg. F.:					
Journal	9	43	91	117	142
Bearing	9	43	90	117	141
Box roof	5	24	55	72	88
Torque, lb.-in.	40	45	43	42	42
Total energy loss, hp. hrs.	0.41	1.40	2.67	3.48	4.35

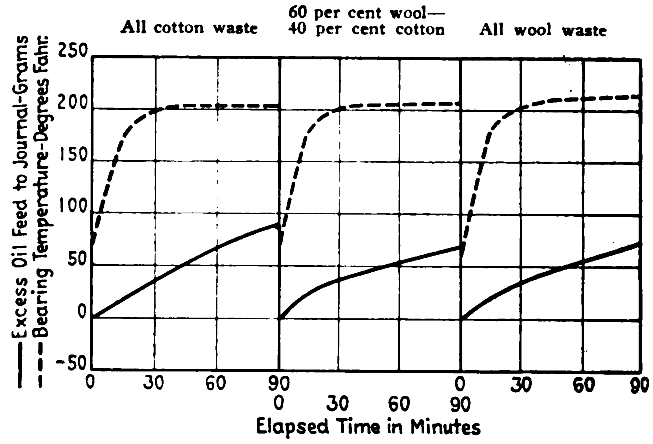
Test No. 2—Renovated Car Oil, Specification E.M. 904-50

	10 m.p.h.	30 m.p.h.	60 m.p.h.	80 m.p.h.	100 m.p.h.
Temperature, deg. F.:					
Ambient	125	125	125	126	126
Journal	138	182	237	268	296
Bearing	138	182	235	265	293
Box roof	134	161	198	217	233
Packing	132	156	185	195	202
Temperature rise, deg. F.:					
Journal	13	57	112	142	170
Bearing	13	57	110	139	167
Box roof	9	36	73	91	107
Torque, lb.-in.	56	59	56	52	49
Total energy loss, hp. hrs.	0.58	1.83	3.48	4.31	5.08



2-¾-in. by 5-in. journal; all cotton waste; 3.5 parts oil to 1 part waste; 563 grams packing per box; 50-lb. journal load; speed 934 r.p.m.; average of eight journals

Fig. 6—Comparative average tests and bearing temperatures of two EM 906-50 oils and one renovated oil



2-¾-in. by 5-in. journals; 3.5 parts oil to 1 part waste; 563 grams packing per box; 50-lb. journal load; speed 934 r.p.m.; average of eight journals

Fig. 7—Comparative average oil feed and bearing temperature of straight renovated oil — 52 S. U. S. at 210 deg. F.; 359 S. U. S. at 100 deg. F.

2. All car oils in the viscosity range tested will feed sufficiently to satisfy lubrication with any waste combination.
3. Artificial fibers are detrimental in packing due to extreme fineness of the fiber which are readily carried on the journal.
4. The addition of wool to packing waste mixtures improves most of the operating characteristics of the packing lubricator, with the notable exception of bearing temperature.
5. The degree of machining and, therefore, uniformity of material has a pronounced influence on the operating characteristics of the waste packing.
6. Bearing temperatures are proportional to the tightness of the packing against the journal.
7. With identical quantities of oil and waste in the pack, oil feed to the journal is inversely proportionate to the tightness of the waste pack.
8. Moisture content of packing has a beneficial influence on its operating characteristics, and
9. E.P. additive oils have better operating characteristics than straight mineral oils.

From the foregoing we can conclude that the three types of material covered by specification EM 905-50 represent the best available packing waste of their respective kind.

In the practice of waste packed lubrication there has always been a difference of opinion as to whether cotton or wool waste was the better vehicle in journal box packing. There are certain fundamental differences between the materials that give to each some advantages over the other. Cotton fiber is a single cellular vegetable seed hair that can be briefly described as a thin hollow tube. Wool fiber is the shaft or non-living hair of the sheep and is a tough, horny growth with a cellular marrow resembling a honeycomb. This structural difference gives to cotton a residual fiber saturation when subjected to a centrifugal force of approximately 40 atmospheres and at a temperature of 250 deg. F. of approximately 30 per cent. Wool under the same treatment will de-oil to from 10 per cent to 15 per cent. The ability of wool to give up its oil more readily and to a lower degree of saturation gives it some theoretical advantage. It has been pointed out, however, that all types of waste thread and combinations thereof will feed considerable excess oil to the journal even when the ratio of oil to waste in the packing has been reduced from 3.5 to 1 to 2.75 to 1. Wool having less affinity for water than cotton, the moisture coalesces more rapidly and settles to the bottom of the box; while cotton, having a greater affinity for water, will retain more in the fiber. In the hot summer months this is a decided advantage in lowering packing resilience and the friction of the packing against the journal.

Because wool gives up its oil more readily than cotton (increased resilience), absorbs less water than cotton (maintains resilience), and has a hard surface structure which generates more friction against the journal than cotton packing, it appears from a lubricating standpoint that the lowest possible journal temperature and, therefore, better lubrication is best assured with all cotton waste. From a functional standpoint wool has less tendency to roll and to produce thread risers and waste grabs than cotton. This can be contributed more to the relatively large diametrical cross section or gauge of the yarn as compared to the cotton thread being furnished currently in cotton waste than to any basic difference in the materials. By far the majority of new cotton waste being saturated into packing is extremely fine, hard and soft slasher heavily machined. The theads are of such a fine gauge that it is difficult to start the test machine under normal room temperature, particularly when using oil containing a pour point depressant, without carrying threads to the bearing.

Recognizing that good cotton packing waste is in extremely short supply, no doubt influenced somewhat by the expanding use of waste in Diesel filters, with its reflection on price, the author believes that the time may be here from a psychological, economic and lubrication efficiency standpoint to turn to a cotton cord of the proper ply and thread gauge specifically designed as a packing material to replace waste in journal boxes. We have done considerable work in the laboratory and are conducting some studies on the railroads with several sizes of cotton cords both as loose packing and captured into pad form with very encouraging results. Packing lubricators made with specification cord have considerably less energy loss in journal friction, resulting in far less lubricator displacement in the box and, therefore, requires a minimum of attention and servicing. Because the material feeds several times more oil than the best

available packing waste, it approaches flood lubrication which gives it considerable lubrication advantage over waste packed lubricators; and, due to its uniform ratio of weight to volume, cord size and length of thread, it has many physical advantages over waste that assures overall reduction in both direct and indirect lubrication costs.

Packing Renovation and Preparation

There are approximately 250 million pounds of journal box packing in the packing pool on the Class I railroads with a current replacement value in the neighborhood of twenty-five million dollars. It is obviously an economic necessity to reclaim this material after its prescribed period of service, and to restore its usefulness by renovation. Prior to instituting A. A. R. specification E.M. 910-50 for renovated waste and packing, renovation was generally accepted and considered to be an economic practice only. The effectiveness of a renovating plant was in too many cases measured by the cheapness of the process, and the value of the product was often weighed only in the scale of visual inspection, little attention being paid to its usage value as an efficient lubricant. While an honest effort was continuously being made on some railroads to improve their lubricating materials and maintain uniformity by laboratory control. It was impossible to elevate renovation to its potential possibilities in the face of the cost barriers of cheap reclaiming practices and because of the immediate submergence of good packing in the vast pool of inferior material.

With the advent of the tighter specification for renovated journal lubricating materials, it became evident that while cleaning oil and waste became a far more exacting job, it also became but one step in the function of the renovating and preparation plant if renovation of packing was to become a fact as well as a name. For, to produce uniform specification packing not only required additional steps in the process of cleaning, but additional preparation of both the oil and waste after cleaning and before saturation into packing.

It is recognized and accepted that oil extracted from dirty packing can be commercially renovated by chemical methods and returned to like service meeting all the physical constant specifications of the all-mineral car oils from which it originated. The more important specification items are remarkably uniform throughout the year and regardless of geographical location. Its behavior in service or lubrication value is high and is of like dependability. Its one shortcoming, like new oils of similar characteristics, is a functional defect when used in waste due to a viscosity temperature curve that, under certain operating and temperature conditions, retards its mobility in waste resulting in periods of increased adhesion of the packing and the journal and a possible cause for failure.

Since the renovated oil, as produced, has good uniformity within the limits of commercial oil specification, it can be blended with a compatible neutral oil to meet practically any theoretically possible physical dimension specification to overcome its defection when used with waste. Any reduction in the lubrication factor of safety of the blended oil which would occur in the boundry film region, can be restored and improved by the addition of oiliness or film forming additives.

On the railroads using low viscosity, high film strength oil in extensive operating tests, the renovated oil, as produced, having an approximate viscosity of 54 S. U. S. at 210 deg. F. and 360 seconds at 100 deg. F. with a viscosity index of 84 is blended with 50 per cent of a 57 neutral oil, producing a finished oil with a viscosity of 41.6 seconds at 210 deg. F. and 127.8 seconds at 100 deg. F. with a viscosity index of 99. To the blended oil is added 0.5 per cent of an E.P. compound. The temperature-viscosity chart, Fig. 8, emphasizes the flatness of the curve produced from the blend of two oils, one having a very low viscosity index. The depressed viscosity in the temperature range below 100 deg. F. is the added factor of safety to the waste pack lubricator by the increased mobility of the oil over the temperature range where the hazards of packing lubrication are the greatest.

It is recognized that the renovation of car oil has advanced to a point where there is no necessity to differentiate between or to provide separate specifications for both new and renovated oil. The renovation of car oil is a positive scientific process while the cleaning of dirty waste is decidedly less positive and infinitely more difficult of accomplishment.

There are many types of packing cleaning and preparation plants producing materials that cover the whole range of quality from materials definitely unfit for service to renovated packing of superior quality. Renovation of journal packing involves the cleaning of two dissimilar materials, one a liquid (contaminated oil) and one a solid (contaminated waste). The first basic step, therefore, is to separate the components of the packing in order to subject each to its best possible medium for cleaning.

In order to produce specification or better renovated waste and packing it is fundamental that, since the oil is regenerated by a chemical process and the waste is cleaned by mechanical means having no effect on the oil, the less residual dirty oil remaining in the fiber of the waste, the cleaner the waste will be, and the less deleterious fine dirt will be found in the finished packing.

Because the final degree of cleanliness of the waste depends to a large extent on the oil and water dryness of the material, if the above basic steps in the renovating of dirty packing are adequately performed, the subsequent step of efficiently removing the extraneous heavy solids together with the short fiber, knots, lumps, balls, etc., can be effectively carried out by mechanical means and preferably in the presence of a strong blast of hot air.

The one remaining and necessary machining operation to waste before resaturation into packing is some mechanical means of intermingling new and renovated thread simultaneously with combing or carding the material to resolve the remaining snarled waste in order further to eliminate short fibers from both the new and renovated material. Fig. 9 graphically illustrates comparative bearing temperatures and excess oil fed to the bearing for new cotton waste, specification renovated waste, and renovated waste that received an additional wash in clean oil. The higher operating temperature of the special renovated material is due to the complete water dryness of the packing which results in an increased volume to weight ratio and excess resilience.

The journal box packing renovating and preparation plant is the heart of car journal lubrication. While the ability of a plant or process to produce a clean and uniform product is the responsibility of the owner railroad, the influence that the material thus produced has on the performance records, as a whole, suggests that the problem could be profitably made a matter of A. A. R. decision and certification on the adequacy of every renovating plant to produce journal box packing to a minimum universal specification. Until such time as reasonable uniform lubricating materials and practices become a fact, as well as a specification, we will continue to have a car journal lubrication problem instead of a successful lubricating practice.

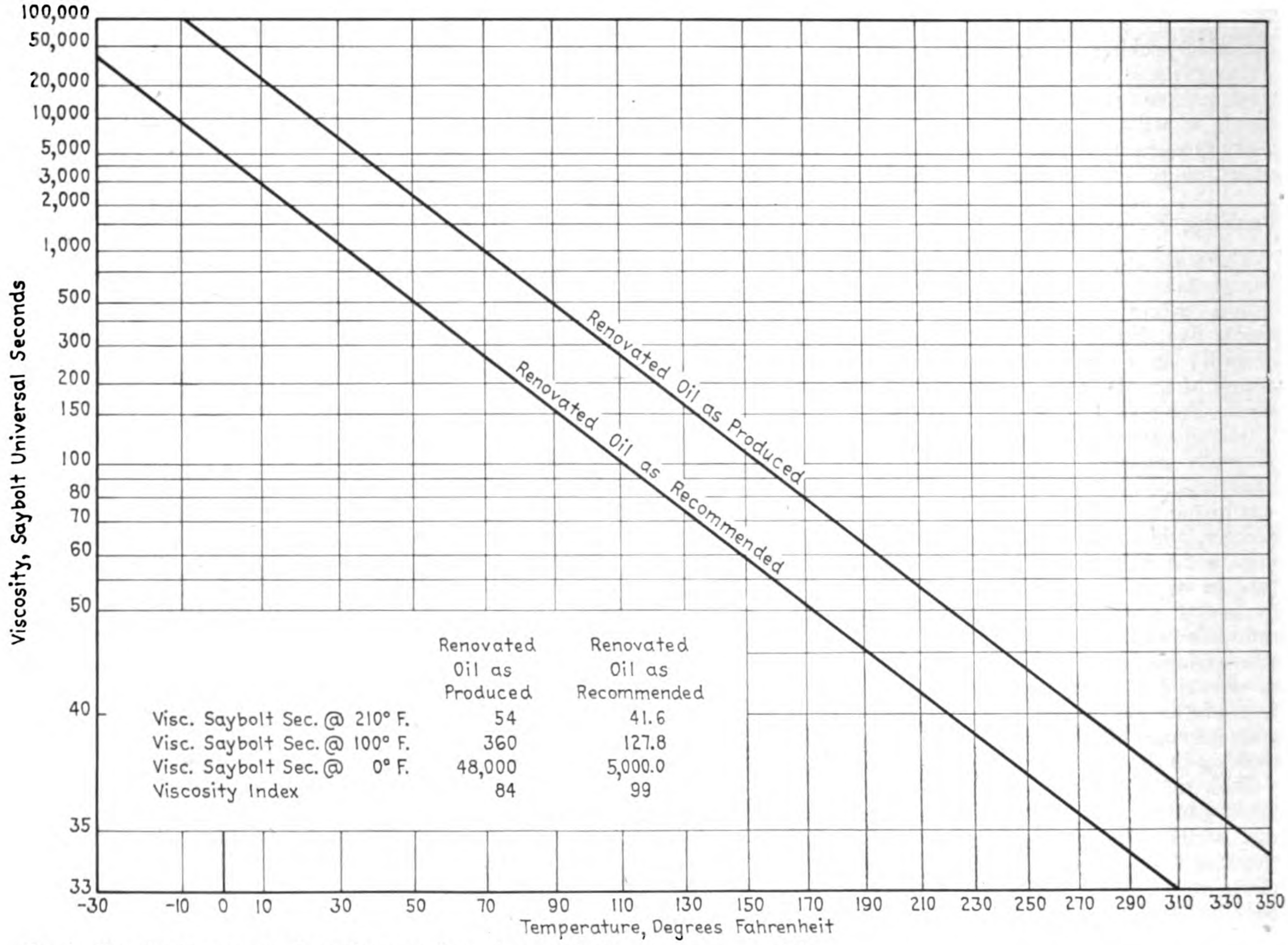


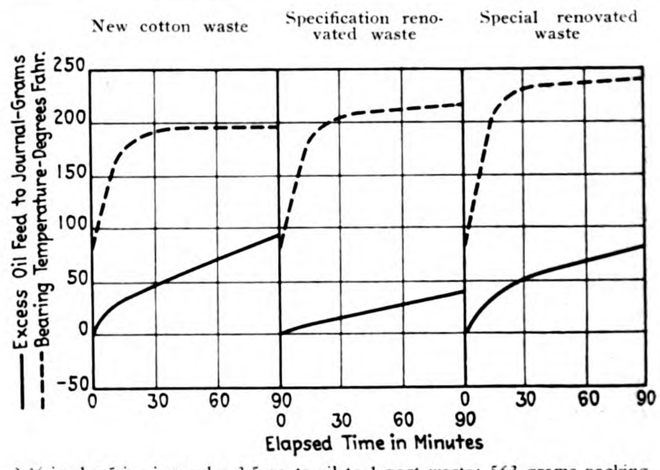
Fig. 8—Viscosity-temperature chart of renovated car oil as produced and as recommended

Conclusions

In order to protect the railroad's investment in the solid type journal bearing and continue the use of the efficient conventional bearing assembly, it is paramount that the present system of indirect self lubrication be brought to its highest potential possibility or give way to some more costly and complicated methods of lubrication. The barrier to elevating the efficiency of the waste pack lubricator is not primarily technological. The program outlined in this paper, while supported by well authenticated data from both the laboratory and the railroad, is in disagreement with the opinions of many railroad mechanical men. It appears to be the human rather than the technical phase of the problem that offers the greatest challenge to the A. A. R. committees charged with the responsibility of improving journal lubrication. There is available to them a wealth of technical information on the subject of journal operation and lubrication.

On the basis of present information the following conclusions are recommended for consideration:

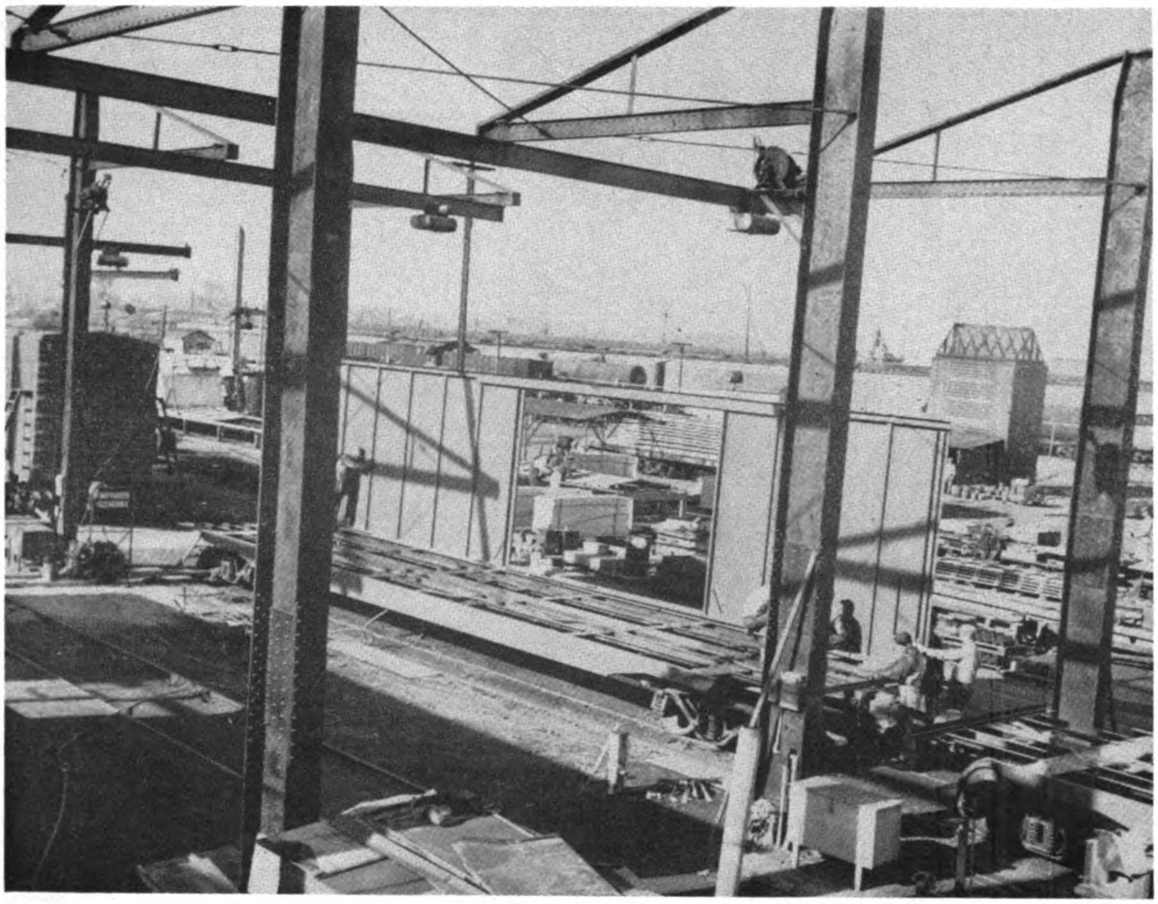
1. Low viscosity car oil reduces the inherent hazards of waste packed lubricators.
2. Car oils in a viscosity range of 40 to 42 S. U. S. at 210 deg. F. with an oiliness or film forming additive are capable of lubricating railway car bearings under extremes of atmospheric temperature, heavy loads, and high speeds with low stabilized temperatures.
3. Fine thread comprising the majority of new cotton waste is producing lubricating failures by increasing the hazards of waste packing.



2-3/4-in. by 5-in. journals; 3.5 parts oil to 1 part waste; 563 grams packing per box; 50-lb. journal load; speed 934 r.p.m.; average of eight journals

Fig. 9—Comparative average oil feed and bearing temperature of low viscosity renovated oil—41 S. U. S. at 210 deg. F.; 116 S. U. S. at 100 deg. F.

4. That cotton cord made specifically for journal box packing be exhaustively investigated.
5. The specifications for renovated waste and packing be reviewed and revised to improve its quality.
6. A system of A. A. R. control by certification of packing renovation and preparation plants be considered as a means of elevating the quality of all journal box packing to a common denominator.



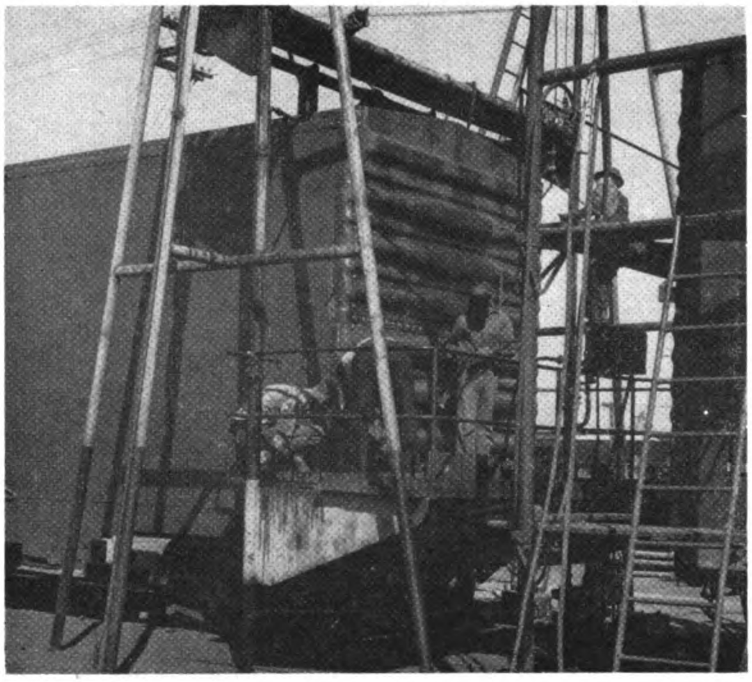
Dual mono-rail hoists are used to apply steel sides, in this instance to an auto-box car

Shop Kinks Help in Building Box Cars

A FEATURE of the freight-car building program of the Southern Pacific at Sacramento, Calif., is the extensive use of straight line production methods and special layouts and equipment designed to expedite work at the various positions. The kind of job done is indicated by the accompanying view of a modern 50-ton box car having a light weight of 44,000 lb. and turned out of Sacramento shops in October 1951. On cars of this type, the production line moves every 25 min. and the output averages 15 cars a day.

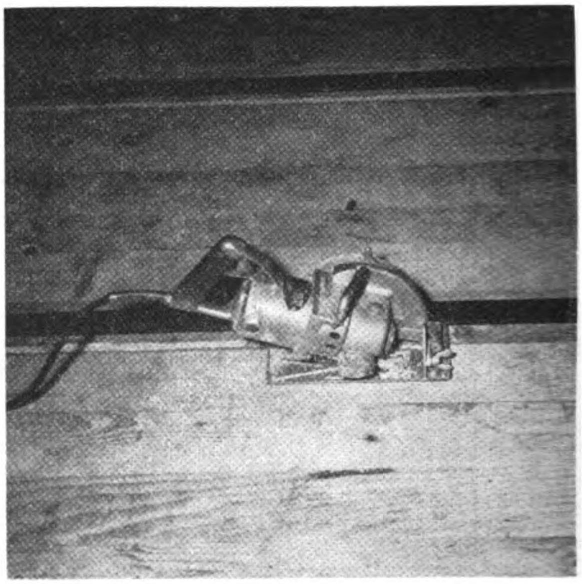
Climatic conditions at this shop are generally favorable to outside work, some details of which are shown in the illustrations. At the position where car sides are applied, for example, heavy vertical steel I-beams and A-frame extensiones at the top, support two monorails and electric hoists which are power operated across adjoining tracks about 20 ft. above ground level, or high enough for handling car sides into position on underframes. Crane hooks engage the tops of the prefabricated car sides (one at a time) on either side of the doorways and they are easily lifted from the specially equipped flat car used to bring them to Sacramento shops. In each instance, the hoists are then traversed to the underframe on the adjoining track and a pair of car sides bolted and braced lightly in place.

The car is then moved to the next station where the ends are brought into position with a hoist-equipped jib crane having 360 deg. swing. The ends are bolted and pinned in place and the car is moved under a riveting scaffold where the sides and ends are riveted together. This scaffold has a platform which is lowered by means of an electric push-button control to the inside of the car

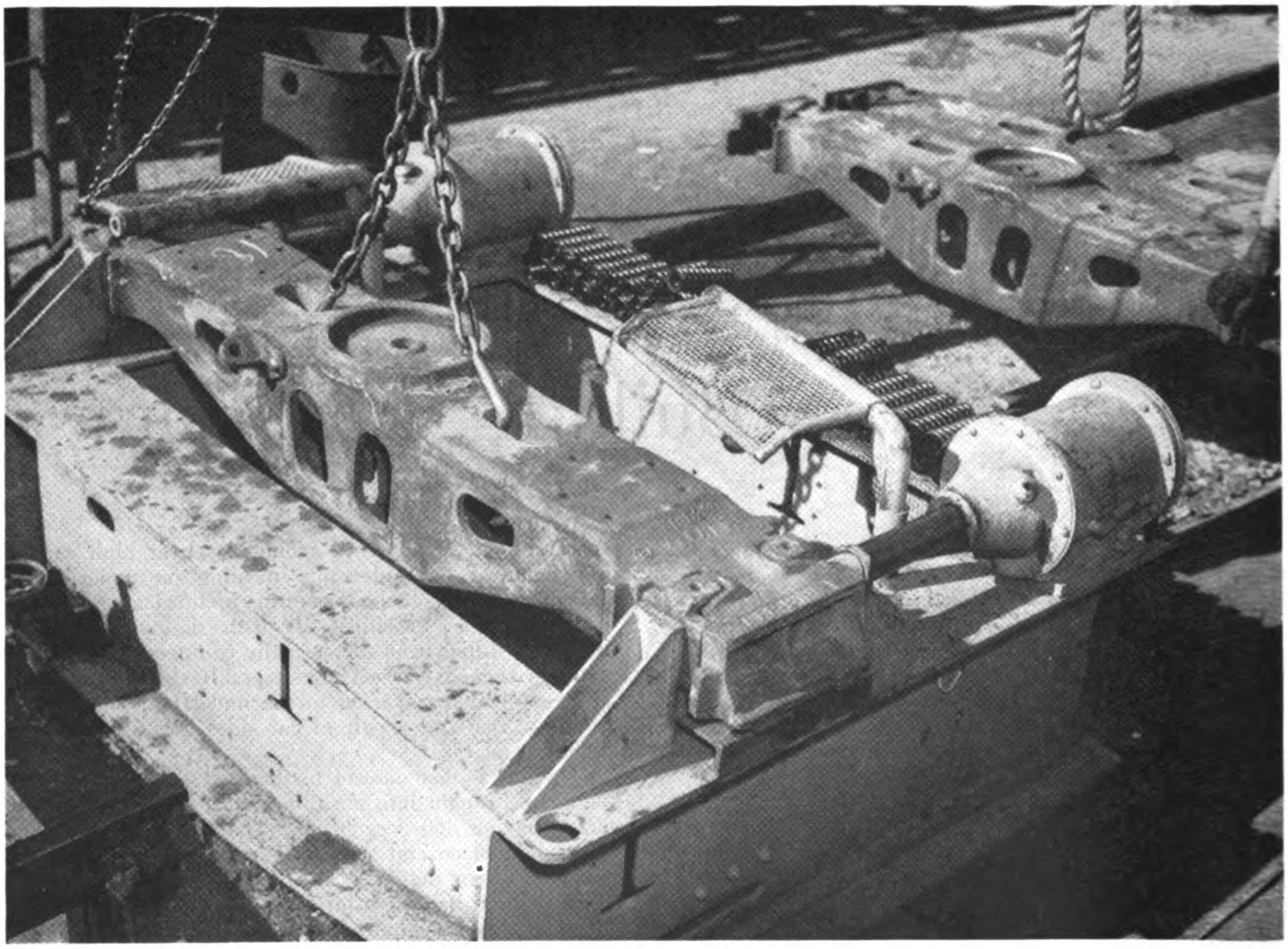


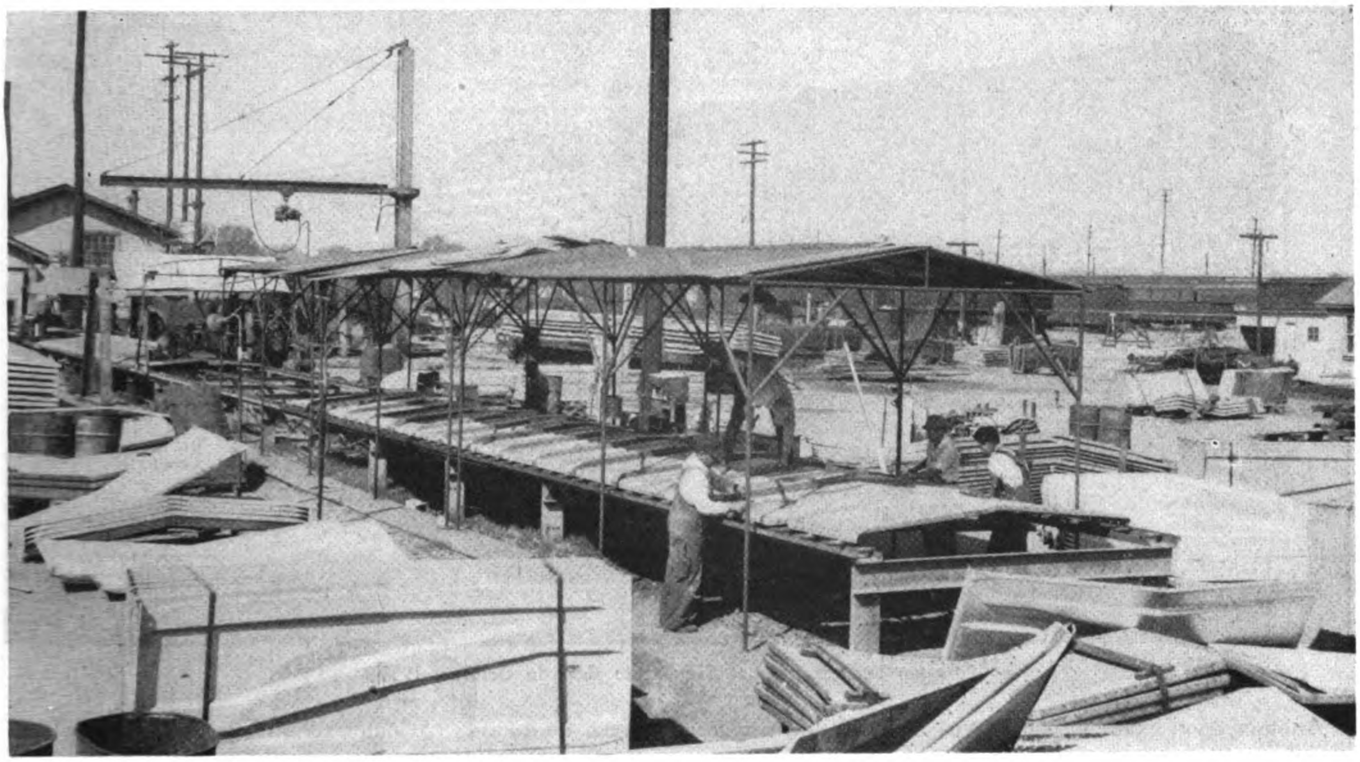
Light but strong steel supports for vertically adjustable inside and outside end-riveting platforms

Portable electric tool cutting mortises for the flanged edges of steel doorway perforated protection plates



Double-acting pneumatic press for assembly Ride-Control bolsters, springs and friction castings





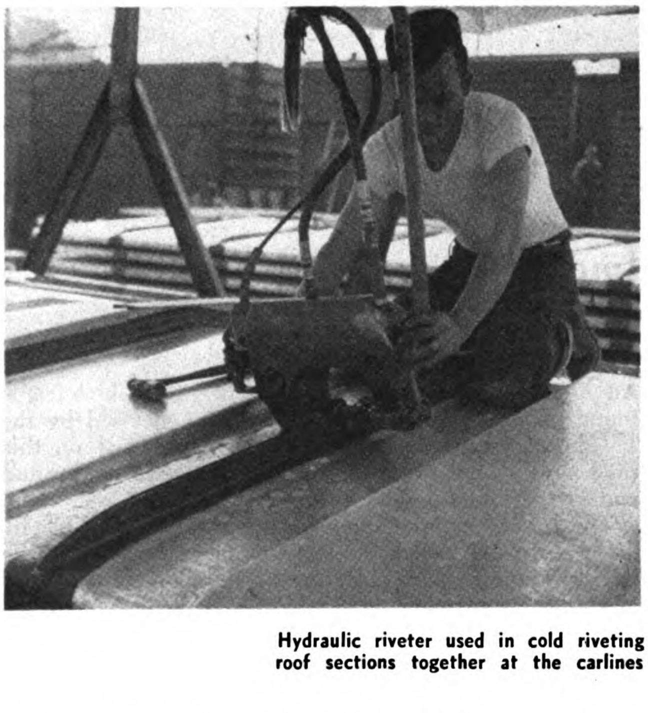
Roof-fabricating position, part of which is covered. Rollers permit easy assembly of sections and movement to riveting spot

and from which the riveter works. At the same level on the outside of the car is another platform for the bucker, rivet heater and forge. Vertical travel of the two platforms is controlled from the riveter's position. The movable platforms can be raised high enough for cars to pass under. The motor, gears, pulleys, etc., are located on a stationary platform at the top of the scaffold.

Assembling Car Roofs

The car roof is purchased in sections which are assembled on a table equipped with rollers for easy longitudinal movement of either individual sections or the completed roof in the course of being fabricated. The table is given overhead protection at the assembly position by corrugated metal sheathing supported on a light steel frame work. The end and inter-roof sheets are first placed in position on the table and the carlines located over the joints. Pins are inserted in a few of the rivet holes and annealed rivets in the others. The rivets are set cold with a Chicago Pneumatic portable hydraulic riveter. supported from a light gantry crane which operates up and down the uncovered portion of the table as required. The running board is applied and bolted down with a pneumatic wrench. The finished roof is then placed on a flat car on an adjacent track, using a jib crane. During a car-building program sufficient roofs are assembled each day to keep one full day ahead of the main car assembly line.

A good example of how time and labor are saved in assembling freight cars at Sacramento shops is afforded by the device used to apply friction castings and springs to the bolsters of A. S. F. Ride-Control Trucks. After the friction castings are forced into the bolster pockets under spring pressure by the action of two air cylinders and pistons, retaining pins are inserted to hold them in place until the bolster is assembled in the truck side frames. Removal of the pins then allows springs to force



Hydraulic riveter used in cold riveting roof sections together at the carlines

the friction castings out against the side frames and serve to break up harmonic spring oscillation under road service shocks.

While pressure is being applied in this device to the friction castings, heavy wire mesh safety guards are swung into position over them to afford protection to workmen in case the pressure should be released for some reason before the retaining pins are applied. One illustration shows a safety guard in application position with one swung out of the way for better visibility.

Fifty-ton box car built at Sacramento shops in October, 1951

Another good example of the type of hand tool which expedites the considerable amount of wood work in building box cars is the power mortising machine. This machine is used to mortise a ½ in. by ¾ in. deep groove in the floor of box and auto cars for bent-down edges of the perforated steel floor protection plates, applied between doorways. A standard Model 77 Skilsaw with a Model 500 Jet Jr. dado and moulding blade is used. A ⅜-in. by 2-in. steel strip is nailed to the floor for a guide.

By this method, the mortises are accurately located and cut to the correct size with a minimum loss of time. The doorway protection plates fit on first application.

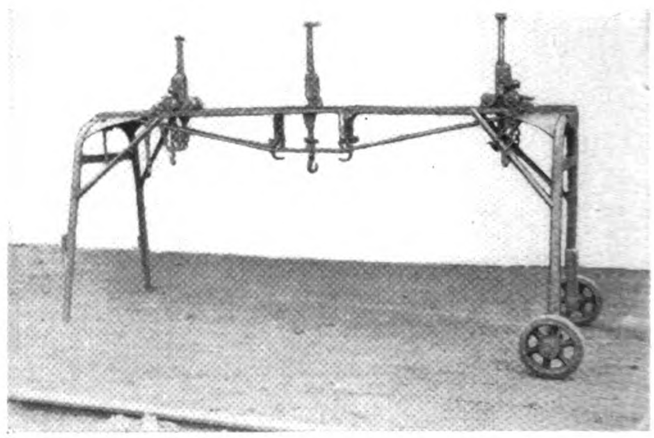
Improved Truck A-Frame

An improvement over the usual type of truck A-frame found on nearly all rip tracks has been devised by the Toledo, Peoria & Western. The A-frames used on this road have a total height of only 52 in. above the ground and are more easily moved about the yard.

The lower height of the A-frame is made possible by the use of ratchet jacks and the manner of mounting the jacks. The center jack for the bolster is a Simplex No. 324 and fits through a slot in the top member of the frame, the slot being shaped to mate with the lift shaft of the jack. The end jacks are Simplex No. 42's and are welded to the frame of the small four-wheel dollies on which the jacks move back and forth along the jack track.

The A-frame rides on two stub-axle wheels 3 in. by 12 in. The handles for moving the A-frame are on the end opposite the wheels and consist of two 14-in. lengths of ¾-in. pipe.

The framing on both ends is of 1½-in. pipe, built up on the wheeled end at the bottom to receive the stub axles. Both ends are reinforced by a horizontally placed length of strap iron ¼ in. by 2 in. located 10 in. below the top. The supports between the end frames and the



This A-frame, designed for easy movement throughout a yard, has a total height of only 52 in.

jack track are angles ¼ in. by 1 in. by 1 in. The jack track is either built up of two angles of this size or made of extra-heavy 1-in. square pipe. Additional reinforcement on the corners is of ¼-in. plate. The two truss rods are ⅝-in. in diameter and the dolly wheels are 1¼ in. by 3 in. The dollies have small handles to move them with the truck sides in place. Suitable holders are incorporated on the frame for carrying the jack handles.

QUESTIONS AND ANSWERS

Diesel-Electric Locomotives*

Duplex Fuel Filter

358-Q.—Where is the duplex fuel filter located? A.—Between the fuel storage tank and the booster pump at the free end of the diesel engine and is mounted on the lower casing.

359-Q.—What does it consist of? A.—Two shells containing filtering elements in the form of replaceable cartridges containing a pound of filtering material.

360-Q.—Are both elements constantly in use? A.—No. The fuel filter handle controls the flow of fuel through either one of the elements or both.

361-Q.—Describe the handle positions. A.—With the handle in a horizontal position one element is in use: vertical, both elements are in use. With the handle in 45 degree position no fuel will flow through the filter.

362-Q.—What is the normal position of the handle? A.—Horizontal position, with one element in use.

363-Q.—What is the advantage of this arrangement? A.—One filtering unit may be used at a time, which allows replacement of the other element during engine operation.

364-Q.—When should the handle be changed to divert the flow of oil to the other cartridge? A.—If there is a gradual drop in fuel pressure, the indication is that the element in use is plugging up and the handle should be moved to the opposite horizontal position, the handle pointer indicating the element in use.

365-Q.—What is the first step to be taken when cleaning the filter? A.—Unscrew the drain plug and drain the filter to prevent spilling oil when withdrawing the cartridge.

366-Q.—What then must be done? A.—(1) Remove cap screws that secure filter shell to cover support and separate shell from cover; (2) Lift out the filtering element, remove its cover and pull out waste or cartridge; (3) Thoroughly clean shell and filter element; (4) Push new cartridge down until it hits bottom of filtering element or repack with good filtering material whatever the case may be; (5) Replace cover on element and re-install in filter shell; (6) Replace cover gasket if necessary, using old one if in good condition. Place filter shell up in cover and tighten cap screws.

Fuel Booster Pump

367-Q.—How many types of fuel booster pumps are in service? A.—There are two types: (1) 1725 r.p.m.-3-g.p.m.-50 p.s.i. (2) 3450 r.p.m.-3?g.p.m.-50 p.s.i.

368-Q.—What does the assembly consist of? A.— An electric motor, driving a gear type fuel booster pump through a flexible coupling on one end of its shaft and a gear type governor oil pump through another coupling on the other end of its shaft.

369-Q.—Describe the pump and its operation. A.—Power is applied to the rotor and transmitted to the idler gear with which it meshes. The space between the outside diameter of the idler and the inside diameter of the rotor is sealed by a crescent shaped projection. As the teeth come out of mesh, there is an increase in volume which creates a partial vacuum. Liquid rushes into the pump to fill this vacuum and stays in the spaces between the teeth of both the idler and rotor until the teeth mesh. Liquid is then forced from these spaces and out of pump.

370-Q.—Where are the brushes for the motor located? A.—At the fuel pump end of the motor.

Felt Disk Type Fuel Filter

371-Q.—Where is this filter located? A.—On the discharge side of the booster pump at the free end of the diesel engine and mounted on a plate supported by the lower casing.

372-Q.—What does the filtering material consist of? A.—The filtering material consists of a number of felt discs assembled on a steel tube strainer.

373-Q.—Should the filter be cleaned while the diesel engine is running? A.—This procedure must not be attempted while the engine is running.

374-Q.—What should be done first? A.—Remove drain plug from filter housing and drain fuel. Remove cap screws that secure filter housing to cover support and separate housing from cover.

375-Q.—What should be done next? A.—(1) Lift out felt cartridge, dip in fuel oil or kerosene, hold hand over the bottom hole, insert air hose in top hole and blow out. Repeat this process six or seven times. (2) If the cartridge has been used over a long period of time and is found excessively dirty, replace with new cartridge. (3) Reinstall new or cleaned cartridge in filter housing. (4) Inspect cover gasket and renew if necessary. Replace filter housing in the cover and securely tighten capscrews.

* This series of questions and answers relate specifically to the Alco-G. E. Diesel electric locomotives.

Steam Locomotive Boilers

By George M. Davies

Stress Relieving Temperatures

Q.—What are the temperature ranges for stress-relieving all welded boilers?—R.F.K.

A.—The A.S.M.E. Code for Power Boilers provides:—Stress-Relieving—Except as specifically provided otherwise in the Code, all fusion-welded pressure parts of power boilers shall be stress-relieved. It shall be done by heating uniformly to at least 1100 deg. F. and up to 1200 deg. F or higher, if this can be done without dis-

tortion. Different temperatures may be used to obtain proper stress-relieving when required by the characteristics of the material. The structure or parts of the structure shall be brought slowly up to the specified temperature and held at that temperature for a period of time proportioned on the basis of at least one hour per inch of thickness and shall be allowed to cool slowly in a still atmosphere to a temperature not exceeding 600 deg. F.

This practice is generally adhered to in the stress-relieving of all-welded locomotive boilers and all-welded boiler shell assemblies.

Tensile Strength of Plates

Q.—The A. S. M. E. Code covering the Rules for Construction of Boiler of Locomotives Section III Paragraph L-11 provides:

"In determining the maximum allowable working pressure, the tensile strength used in the computations for steel plate shall be that stamped on the plates as provided for in Specification SA-70, which is the minimum of the stipulated range of 55000 p.s.i. for all steel plates, except for special grade having a lower tensile strength."

Should this paragraph be interpreted as providing that 55000 p.s.i. must be used in the formulae for computing the maximum allowable working pressure, irrespective of the tensile strength of the material, i.e., a material of higher tensile range than that of 55000-65000 as provided for in Spec. SA-70?—F.E.L.

A.—In determining the maximum allowable working pressure, the tensile strength used in the computations for steel plates shall be that stamped on the plates. In the case of Specification SA-70 which has a tensile range of 55000-65000 p.s.i. the minimum of 55000 p.s.i. should be used; however, in the case of steel having a higher tensile range such as steel to Spec. SA-203, which has a tensile range 65000-70000 the minimum tensile 65000 p.s.i. should be used.

Machining New Dome

Q.—What is the proper method of handling a one-piece flanged dome for machining and drilling; the new dome was received blank from the builders?—F.E.M.

A.—The first operation in preparing a one-piece flanged dome for application to the shell is to lay out and drill the rivet holes in the base flange for the shell connection.

A thin metal half template of the rivet arrangement is made from either the boiler drawings or taken from the shell course. The template is clamped to the inside surface of the base with the template center in line with the dome center line. The rivet hole locations are then center punched directly on the base. The dome center line is identified by two small indentations made on the under side of the base flange, by the holding die, during the flanging operation.

The holes are drilled on a radial drilling machine with the bottom surface of the base facing the drill. The dome is often moved on the table so the holes will be drilled radial to the boiler shell.

The template outside should allow 3/8-in. stock on the dome base to be milled off. The excess material is burned off for the milling operation.

The next operation is to cut the opening in the top of the dome and counterbore the top surface around the opening for the copper gasket between the dome and the cap if gasket is to be used. These two operations are done in a boring mill. Two cutting tools are necessary for cutting the opening. Tho follower tool should have a slightly narrower cutting edge to prevent the lead tool from binding.

A drilling gage is used for drilling the dome cap stud holes in the dome and the dome cap, milling the edge of the dome base completes the dome for riveting to the boiler shell.

Schedule 24 RL

Air Brakes

Train Control Operation

1239-Q.—After the handle is placed in the application zone what should be done?

A.—Open the cock at the NS-1 reducing valve to release the brake and recharge the system. Move the SA-2 brake valve handle to release position.

1240-Q.—Suppose that the brakes fail to release after a short interval?

A.—In this case it may be necessary to make an emergency application by opening the conductor's valve to reduce an overcharge of the auxiliary and emergency reservoirs.

1241-Q.—In the event that the D-24 Control valve is equipped with a controlled emergency cock, how should the handle be placed?

A.—In *P* position.

1242-Q.—What should be done when the A and B units are re-assembled and the control transferred to the A unit?

A.—It should be noted that the cut-out cock at the NS-1 reducing valve and the SA-2 brake valve are closed, all end hose connected and cocks open.

Procedure For Changing Operating Valves

1243-Q.—When about to change any operating valves or devices, and the main reservoirs are charged, what should first be done?

A.—Place the automatic brake valve handle in emergency position, leaving it there. Depress independent brake valve handle in release position, rotair valve in "PASS" position until auxiliary and emergency reservoirs are drained.

1244-Q.—What next should be done?

A.—Close the equipment cut-out cock (side vented) located in the main reservoir pipe between the brake equipment and the last main reservoir.

1245-Q.—What procedures should be followed after the devices are changed?

A.—The equipment cut-out cock should be opened before brake valve handle is put in charging position.

1246-Q.—What precaution should be taken when there is no attendant in the cab?

A.—The independent brake valve should be left in the application zone when no attendent is in the cab.

1247-Q.—What are the instructions in regards to the independent brake valve when handling long freight trains in road or switching service?

A.—The independent brake valve should be operated with care, to prevent damage to cars and lading.

1248-Q.—What causes the damage referred to?

A.—It is caused by slack running in or out too fast.

1249-Q.—What should be done in case of an emergency arising while the independent brake is applied?

A.—Apply the automatic brake instantly.

1250-Q.—When at all practical, what should be done as soon as the train comes to a stop, especially in passenger service?

A.—Release the automatic brakes as soon as the train comes to a stop and hold the train with an independent application.

1251-Q.—What precaution must be taken with the B unit when operating with the Hostler's brake valve or hauling the units Dead in a train?

A.—With the electro-pneumatic brake, the straight air pipe must have an atmospheric opening, either through the 21-B magnet portion (cut-out cock open) or the end cut-out cocks.

1252-Q.—When would this rule apply?

A.—Any time the hose is not connected and open through into the A unit pipe.

ELECTRICAL SECTION

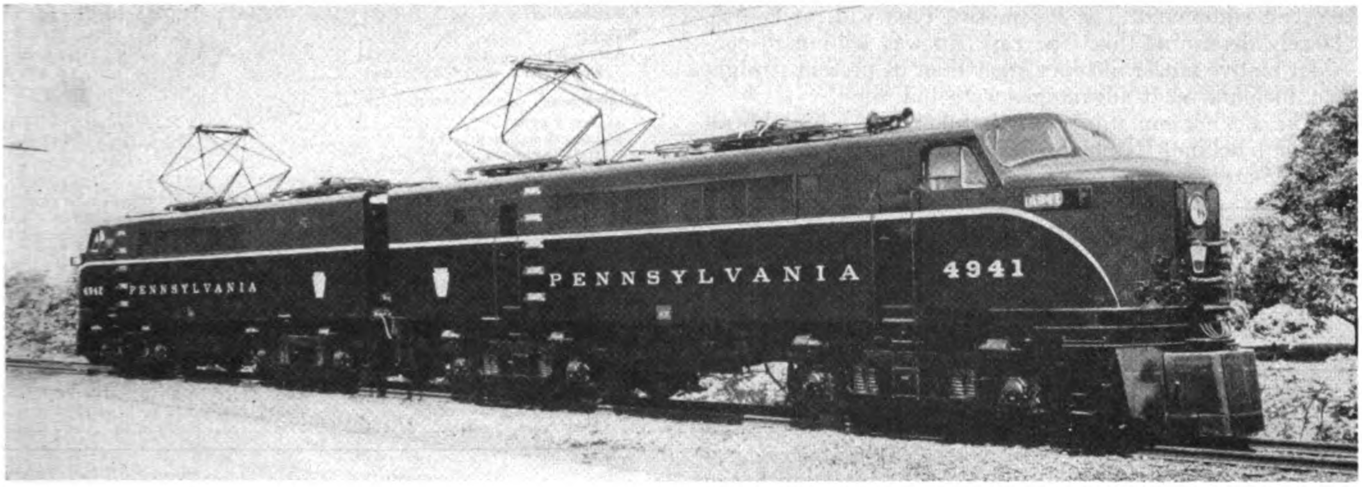


Fig. 1—Two units operating in multiple as a 5,000-hp. locomotive

Series A. C. Electric Locomotives With Dynamic Braking*

New Pennsylvania locomotives built by General Electric which meet specifications of simplicity and low first cost are now in regular service

By F. D. Gowans†
B. A. Widell†
A. Bredenberg†

RAPIDLY increasing use of diesel-electric locomotives in the past few years has caused much speculation on the future of railroad electrification. Proponents of the diesel-electric point to its lower first cost, while the electric locomotive enthusiast claims lower maintenance and operating costs. The final answer will be an economic one, dependent upon such things as future electric power developments and new sources of fuel oil supplies.

The important fact is that the railroads have accepted the electric drive as the best and most efficient means yet developed for propelling railroad vehicles. Now it is of prime importance that the components of this drive,—whether for straight electric or diesel-electric locomotives,—and the vehicle which it propels be continually improved. The builder should make every effort to include in his new designs improvements in materials and processes, together with any other factors, that will contribute to longer life, higher availability and lower overall cost.

*Abstract of a paper presented at the Mid-Winter Meeting of the American Institute of Electrical Engineers, held in New York, January 21-25, 1952.
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What Type Locomotive?

One important factor in the success of a locomotive is the type and arrangement of the mechanical parts. Past designs with many axles (some idle), complicated trucks and crowded cabs are good examples of high first cost, difficult manufacture and expensive maintenance.

Freight traffic on the road's electrified lines was studied over a period of years to determine what size unit would give the best utilization. A four-axle, locomotive unit capable of operating in one, two, three or four-unit combinations was chosen. Experience with existing electric freight locomotives showed that tonnage ratings should be based on average tractive force over the ruling grades equal to 16 per cent adhesion. At the 60,000-lb. axle loading limit specified by the railroad, this amounted to

a one-hour tractive force rating of 9,600 lb. per axle, or 38,400 lb. per unit. Table I shows how such units could handle the railroad's freight traffic through a typical industrial cycle. This size is also most desirable because of its simple mechanical construction and the additional availability it offers over larger units.

Selection of Electric Equipment

Equally important is the type and arrangement of the electric equipment. The locomotive type will, of course, largely determine this. The railroad was willing to consider motive power of types other than its present straight a.c. locomotive, if advantages were indicated.

The a.c. commutator motor is inherently a high-horsepower machine. Its chief advantage lies in its ability to take 25-cycle power from the trolley without intermediate

TABLE I—UTILIZATION OF LOCOMOTIVES

Number Units	Per cent of Freight Traffic Peak	Normal	Depression
1	13	34	64
2	60	63	36
3	22	3	0
4	5	0	0

conversion equipment. For this reason, locomotive ratings are based entirely on the traction motors. With over-voltage transformer taps, motors can be operated at extremely high short-time ratings for accelerating heavy trains and ascending grades. The relative simplicity of the equipment permits good arrangement, making ample space available for maintenance and inspection. The additional weight and cost of the a.c. motor are offset by the conversion equipment necessary if d.c. motors are used.

Advantages were decidedly in favor of continuing with the straight a.c. type locomotive. This has been the basic motive power on the Pennsylvania's electrified lines since 1931, and has given commendable service. Railroad schedules, operating practices and shop facilities have been built up around it. Twenty years' experience with this plant has demonstrated that simplicity of mechanical construction and of electric circuits is the key to low maintenance and reliable operation.

Characteristics

Table II gives weights, dimensions and ratings of a single unit. Units may be coupled for multiple operation

TABLE II—LOCOMOTIVE UNIT DATA

Classification	B-B-240/240—4GEA632—11,000 volts, 25 cycle a.c
Weight:	
Total locomotive, fully loaded	240,000 lb.
Per driving axle, fully loaded	60,000 lb.
Dimensions (Approximate):	
Track gage	56½ in.
Length inside knuckles	54 ft. 3 in.
Height over cab roof	14 ft.
Height, trolley locked down	15 ft.
Width over cab sheets	10 ft. ⅛ in.
Width overall	10 ft. 7 in.
Total wheel base	39 ft. 10 in.
Rigid wheel base	11 ft.
Length between centerplates	28 ft. 10 in.
Wheel diameter	48 in.
Coupler height	34 in.
Clearance, motor gear case to rail	4⅝ in.
Minimum curve	275 ft. radius—21 deg.
Ratings:	
Tractive force at 25 per cent adhesion	60,000 lb.
Tractive force, continuous rating	35,400 lb.
Tractive force, one-hour-rating	38,400 lb.
Speed, one-hour rating	25.5 m.p.h.
Maximum speed	65 m.p.h.

from either end, with as many as four units operating together.

Characteristics for one traction motor are shown in Fig. 2. These may be used in combinations of 4, 8, 12, or 16, with 1, 2, 3 or 4 units.

In recent years rheostatic braking, now commonly used on diesel-electric locomotives, has established its worth in dollars and cents. This usefulness, especially in freight service, has now resulted in its application on a straight a.c. locomotive for the first time in the United States. Braking characteristic curves for the two-unit locomotive are shown in Fig. 3. The a.c. commutator motors are well adapted for this use, rating 750 hp. each, during braking within the limits of maximum excitation and commutation.

Mechanical Design

The mechanical design—with a streamlined, single-end cab carried on two, two-axle, swing-bolster trucks—is

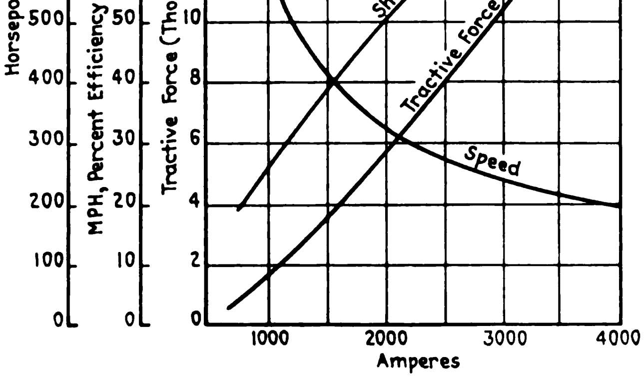


Fig. 2—Motor characteristics on 230 volts with 83/21 gearing and 48-in. wheels

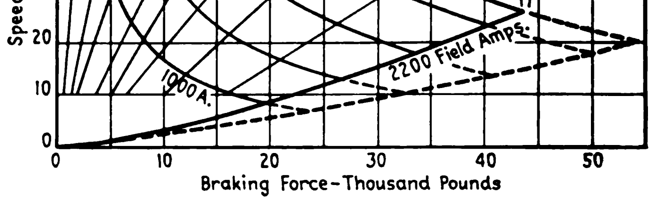


Fig. 3—Speed-braking force curves for one four-motor locomotive unit with 83/21 gearing and 48-in. wheels

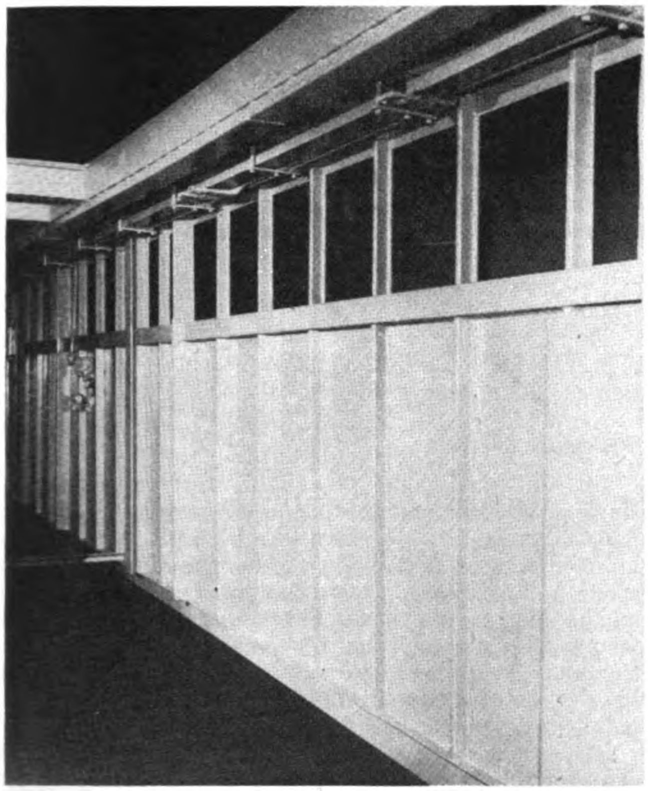


Fig. 4—Side sheet construction used to form supporting truss for platform

quite different from earlier a.c. freight locomotives. Except for the pantographs on the roof, this locomotive resembles the conventional diesel-electric "A" unit. Collision framing at each end is of sturdy construction. The streamlined nose affords additional protection and excellent visibility for the engine crew.

Doors are located at each end of the unit, on each side of the operating compartment, and on the right side of the apparatus compartment toward the rear. Framed grilles in each side of the apparatus compartment as high as possible from the ground, permit entrance of clean cooling air for the traction motors, controls and transformer.

The entire cab and platform structure is fabricated from steel sheets, plates and shapes; and is designed for subassembly of parts and equipment groups. Arrangement of apparatus in the cab provides maintenance aisles on each side, with doors into the operating compartment at the front, and access to the rear end door. Hatch covers over all equipment permit complete accessibility from the roof.

Locomotive platforms were formerly designed to carry the entire equipment load and withstand the buff without undue deflection. The cab side sheets and roof were part of the platform load. No doubt they added some stiffness to the structure, although this was not considered in the calculations. By designing the side sheets to prevent buckling, they can be used as side trusses to carry the entire load. The consequent reduction of material in the platform amounts to approximately 40 per cent, as compared with a 5 per cent increase in side sheet material. This construction (Fig. 4) results in considerable weight and cost reduction, and has been adopted for the new locomotive design.

Conventional two-axle, swing-bolster trucks are used (Fig. 5). These have cast-steel frames, drop-center equalizers, and clasp brakes. The spring rigging is generally similar to that used on Pennsylvania passenger cars. Coiled springs support the truck frame on the equalizers, and an arrangement of coil and elliptic springs supports the bolster on the spring plank.

Location of Apparatus

Two factors largely determine locomotive inspection and maintenance costs: reliability of the equipment and its accessibility in the locomotive. Although the latter may be secondary, neither can be ignored if the locomotive is to be considered satisfactory. In designing these units, prime consideration was given to the location of apparatus. This was planned first and, with few exceptions, the mechanical design was made to suit.

Fig. 6 shows that the traction-motor control groups and blowers are located directly over the trucks. Bus bar and cable runs are thereby kept to a minimum, and blowers discharge directly downward into the motors. Conditions at the rear end are ideal, but at the front end the control group and one blower had to be offset to accommodate the operating compartment. Both motor control groups receive power from the transformer and its control group which, together with the auxiliary equipment, is located centrally. Motor controls are accessible through doors along each side aisle. A crosswise maintenance aisle for the transformer group extends from one side aisle to the other.

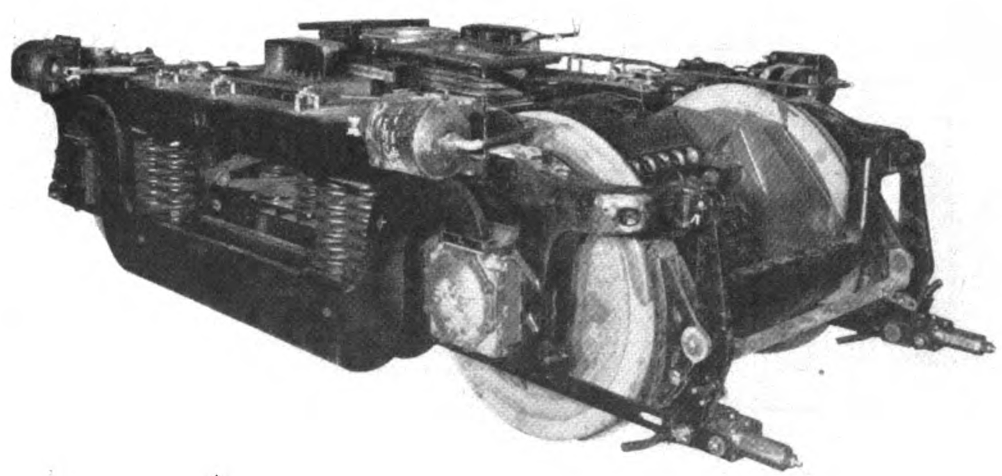


Fig. 5—Two-axle, swivel truck of conventional design used on this locomotive

The location of the transformer high-voltage bushing and Thyrite resistance lightning arrester on the roof is unusual. The transformer tank is the full height of the apparatus cab, allowing the bushing to protrude through a cutout in the hatch cover directly under the front pantograph. An insulated bus on the roof connects both pantographs, the lightning arrester and the transformer. It also serves as the terminal for the ground switch. This arrangement eliminates all 11,000-volt cable, cable preparation and conduit, together with the shields and barriers necessary for the protection of workmen inside the apparatus cab from contact with this voltage.

The two pantographs on the roof of each unit are accessible from inside the cab by means of a ladder and hinged door in the hatch cover. This door is mechanically interlocked with the pantograph grounding switches to prevent access to the roof when the pantographs are ungrounded.

Auxiliary Equipment

Considerable improvement has been made in auxiliary equipment. For instance, the use of axial-flow blowers has contributed to better arrangement and accessibility of equipment because they occupy about half the space of centrifugal blowers of the same rating. The blowers incorporate an air-cleaning feature which removes about 60 per cent of the dirt, water and snow from the air furnished to the electric equipment. Since they are driven by three-phase induction motors, the expense of brushes, commutator maintenance and frequent inspection is eliminated. Because of their exceptionally good characteristics for ventilating this type of equipment, these blowers have been used throughout the locomotive.

An auxiliary motor-generator set provides three-phase power for the blowers and d.c. power for control and battery charging. It consists of a two-speed, 25-cycle, single-phase induction motor driving a 125-cycle, 3-phase alternator and a 37.5-volt d.c. generator. The motor is arranged for pole changing to give half (750 r.p.m.), and full (1,500 r.p.m.) speed. This gives half- and full-speed operation of the blowers since they are connected directly across the alternator.

Air brake equipment is 8EL, modified to use the DS-24 automatic and S-40-F independent brake valves. This will permit application of speed control later.

A new feature is the use of the diesel-electric locomotive type air compressor. It is coupled to a 25-cycle, single-phase induction motor and arranged for unloaded starting. It has a capacity of 220 cu. ft. per min. at 725 r.p.m.

Two main air reservoirs, having a combined volume of 50,000 cu. in., are located under the platform.

Traction motor excitation, during rheostatic braking, is provided by a 1,500-r.p.m., 25-cycle, single-phase induction motor, driving a 10-pole, 10-volt d.c. generator.

Traction Motors

The GEA 632 motor (Fig. 7) is a 16-pole, 25-cycle, single-phase, commutator-type, a.c. motor with commutating poles and pole face windings. It is rated 625 hp. continuously at 230 volts. The maximum operating speed is 1,800 r.p.m., corresponding to a speed of 65 m.p.h. on these particular locomotives. The motor is mounted on the axle and a nose support on the truck transom. A cushion gear, pressed on the axle, is driven by the motor pinion. Motors are connected in two parallel groups, each with two motors in series.

It has long been recognized that better performance can be obtained from a straight-electric locomotive traction motor than from a diesel-electric or motor-generator locomotive motor. On a.c. locomotives, this extra performance is obtained by providing overvoltage taps on the transformer. The multi-pole, low-flux per-pole type of single-phase, a.c. motor is ideally suited to transmit this additional power. Although the design is largely predicated on considerations of standstill starting phenomena, it is also the best to withstand applications of overvoltage. The first motors of this general type were placed in service on the Pennsylvania in 1931.

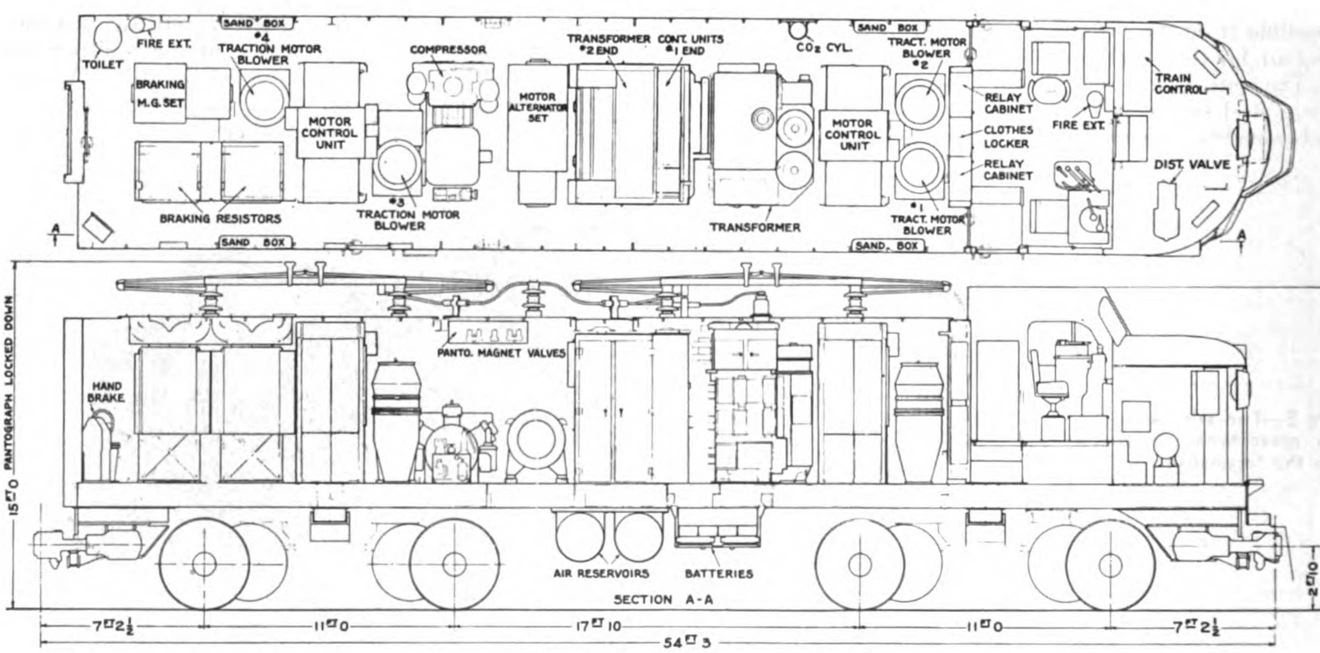


Fig. 6—Location of principal pieces of apparatus in the locomotive cab

The present motor reveals the significant design progress made since 1931. The continuous horsepower per pound increased 44 per cent in the 1934 design, 13 per cent in the 1938 design, and 26 per cent in the 1951 design.

Electrical and Mechanical Differences

Electrical design points differing from former motors of similar type are:

1. A slightly smaller exciting-pole air gap, and a larger commutating-pole air gap.
2. Armature slots that are open instead of partially closed, to permit using pre-insulated coils with their inherent advantages.
3. Solid armature bar in place of the folded bar.
4. More armature slots per pole and shallower slots, to partially offset the additional losses in the solid armature bars at high speeds.

Brush holders are of the one-piece type, light and simple in design. Ample clearances around the brush prevent its binding in the holder as a result of accumulations of dust.

Armature coils are of semi-one-piece, split-throw design with flattened leads for connecting to the commutator risers. Less than half as many back end brazes are required as formerly. The bars have a straight portion at the back end connections of the winding to give additional surface for binding purposes.

A revolving brush-holder yoke permits inspection and replacement of brushes. This is located to line up the brush holders in correct relation to the main poles by a key set accurately with fixtures at the factory.

The cushion gear is similar to those used in the past, with the exception that tube-form synthetic rubber joints replace the flat or spiral steel springs formerly used to dampen the 50-cycle torque impulses.

Insulation

The continuous motor rating is given on the A.I.E.E. basis for Class B insulation—120 deg. C. rise on the armature and 130 deg. C. rise on the field as measured by resistance. Conductor insulation, armature polycoil tapes, and stator winding slot wrappers consist of glass and mica, treated with silicone varnish. Each motor is blown with 4,200 cu. ft. of air per min.

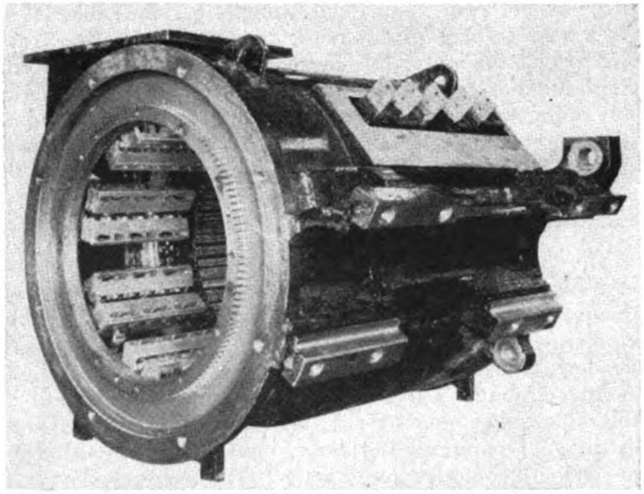


Fig. 8—Traction motor stator, with frame head removed to show brush holders and revolving yoke

Main Field Flux Control

At standstill, and during very low speed operation. circulating currents exist in the armature turns which are short-circuited by the brushes. These currents are induced by the 25-cycle main field flux. At low motor speeds, they cannot be restricted by commutating-pole flux control. In order to hold these currents to a tolerable value, the main field flux must be limited in amplitude. This is accomplished by a combination of autotransformer and inductive shunt which weakens the field to 40 per cent of full strength (FS-3, Table III). As the locomotive speed increases, a "speed voltage" is generated in these short-circuited turns by an out-of-phase component of the commutating-pole flux, often referred to as quadrature compensation. This voltage serves to reduce the circulating currents to the extent that, at three m.p.h., the autotransformer may be cut out. This

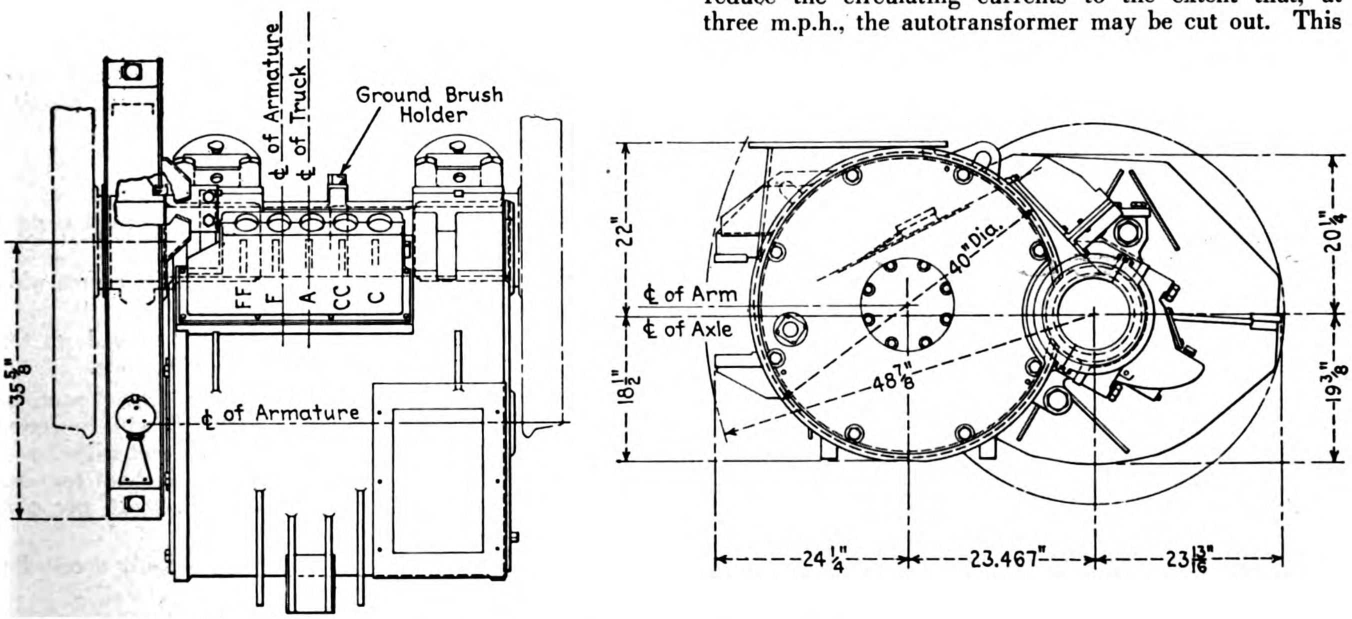


Fig. 7—Outline of traction motor with principal dimensions

gives 76 per cent main field strength (FS-2, Table III). As a result, for a given motor torque (locomotive tractive force), the motor line current is significantly reduced. At 7 m.p.h., the circulating currents have decreased to the point where the main field shunting may be completely removed. Operation then continues in full field (FS-1, Table III), at higher speeds.

Commutating Field Flux Control

The quadrature compensation voltage mentioned above is a function of both motor speed and the magnitude of the quadrature component of commutating pole flux. This component of flux, lagging the motor line current by 90 deg., is produced by shunting the commutating field. A given shunt will restrict circulating currents to a tolerable value only over a limited speed range. Three settings of commutating pole shunting are required to cover the locomotive speed range. The low-speed shunt—a resistive impedance—is connected across the commutating poles from standstill to 26 m.p.h. As already noted, this is not fully effective below 7 m.p.h., and main field shunting must be resorted to (Conn. Nos. 1, 2 and 3, Table III). Above 26 m.p.h., commutation again becomes unacceptable with this shunt. Supplementary resistive-reactor impedances are connected over the intermediate speed range from 26 to 40 m.p.h. (Conn. No. 4, Table III). Additional impedance is connected in the high-speed range above 40 m.p.h. (Conn. No. 5, Table III).

TABLE III—MOTOR CONNECTIONS

Conn. No.	Main Field Connection	Interpole Field Connection	Approximate Speed Range	Contactors Closed*
1	...Weak field (FS3)	Low speed (LS)	0 to 3 m.p.h.	F12, F13, F14R, F24R
2	...Intermediate field (FS2)	Low speed (LS)	3 to 7 m.p.h.	F11, F12, F14R, F24R
3	...Full field (FS1)	Low speed (LS)	7 to 26 m.p.h.	F11, F14R, F24R
4	...Full field (FS1)	Intermediate speed (LS)	26 to 40 m.p.h.	F11, F14R, F24R, F15X, F25X
5	...Full field (FS1)	High speed (HS)	Above 40 m.p.h.	F11, F14X, F24X, F15X, F25X

* Contactors for No. 1 and No. 2 motors only are listed.

Control Equipment

Multiple-unit, single-end control of the electro-pneumatic type is used. Two spring-raised, air-lowered pantograph trolleys collect current at 11,000 volts from the trolley wire. The main transformer—rated at 2,655 kva., 11,000/762 volts, 25 cycles, single-phase—is Pyranol filled and forced ventilated.

Rheostatic Braking Operation

For braking, the traction-motor armatures are connected in two groups. The two armatures in series in each group operate as d.c. generators across a constant-value braking resistor. All four motor fields are connected in series across a low-voltage, d.c. exciter, the shunt field of which is supplied from the 37.5-volt, d.c. control circuit.

Control of braking effort and speed is obtained by varying the exciter shunt field. This is done manually through the braking handle on the master controller which operates only seven contactors in the exciter field circuit to give 17 braking steps.

Low-Voltage Control Circuits

The master controller has a main handle to control acceleration, a reverse handle, a braking handle to control rheostatic braking, and a selector handle to control the motor-alternator set. Suitable mechanical interlocking prevents improper operation of these handles.

Protection

Circuit and apparatus protection for these locomotives centers in a transformer protective relay for the main transformer, and a ground relay for the traction-motor and auxiliary circuits. These are supplemented by wheel-slip relays for the traction motors and thermal overload devices for the auxiliaries.

The ground relay has a set of "A" contacts which trip when the relay element rotates part way and a set of "B" contacts which operate when the relay travel is complete. In case of a ground on a traction-motor or 25-cycle auxiliary, the "A" contacts open and latch in the tripped position, de-energizing the traction-motor line contactors and auxiliary contactors. With these open, the grounded equipment is cleared and the relay returns to normal position. The "A" contacts may then be reset remotely from the operator's position. After the faulty circuit has been isolated, operation (possibly at reduced capacity) may be continued.

Should the ground be on the transformer side of the various line contactors, as mentioned above, the ground relay will not stop after tripping its "A" contacts, but will continue around and close the "B" contacts, causing the auxiliary relay to operate. This connects the desensitizing resistor in series with the ground relay operating coil, causing the latter to return to its original position so that the "A" contacts may be remotely reset. This arrangement permits operation of the locomotive in an emergency with a ground between the main transformer secondary and the line contactors of connected apparatus, with the ground relay having been automatically de-sensitized.

There are two systems of wheel-slip protection for the traction motors. One consists of a power tie connecting the mid-voltage points of both two-motor series circuits. For each circuit there are two motors in series and both are on the same track. Two current-element, wheel-slip relays are located in this power tie.

The second wheel-slip protective system is provided by a.c., d.c. voltage relays, two in each two-motor circuit. They operate on a difference in potential between the two motors in each group. One relay in each group is a warning relay, the other a trip relay.

These systems also provide protection against overspeeding as a result of a slipped pinion on the traction motor.

Summary

These locomotives have been designed to meet certain basic requirements:

1. A unit size to give the most efficient use over a wide range of traffic conditions.

2. A type of electric equipment well proved on the railroad and most suitable for its requirements.

3. High horsepower: the locomotive rates continuously at 625 hp. per axle, 26.5 m.p.h. It will, however, accelerate trains up to 33 m.p.h. at 25 per cent adhesion—corresponding to 1,300 hp. per axle—and haul tonnage trains over ruling grades at 41.5 m.p.h. at 16 per cent adhesion, 1,060 hp. per axle.

4. Arrangement of equipment to give ready access for inspection and maintenance.

5.Higher availability and lower operating expanse.

6. Lower first cost.

DIESEL-ELECTRICS—How to Keep 'Em Rolling

6 Insulation—Its Purpose and Its Requirements*

If insulation is given the care it deserves, the maintainer can avoid a lot of grief and hard work

Why Insulation?

Electricity, like many people, follows the path of least resistance. It is always looking for short cuts to get out of doing work. The material we use to keep it on the job is called insulation. It confines the electricity to a useful path — usually through copper wires. Non-metallic materials like glass, mica, porcelain, wood shellac, and varnish are some of the better insulators. Even dry air is good for this job. Electricity has a tough time getting through or across these materials.

If the conductors of a machine could be bundled up in plenty of insulation, you might think the machine would last forever. But the problem is not that simple. "The more the better" isn't always a good recipe to use with insulation. Remember, heat is generated in an electric machine when it is working. And good electric insulators are also good heat insulators. This means that insulation acts like a blanket to keep the heat in the machine. While not enough insulation will wreck a machine, by allowing electricity to escape, too much insulation will also hurt it by making it overheat. So, to let the heat out, just enough insulation is used to keep the current in the wires.

Another thing, there is only so much space in a ma-

* This is the sixth of a series of articles on maintenance of diesel-electrical equipment. This article is written by J. W. Teker and J. R. Schrecongost, both of the Locomotive and Car Equipment Department, General Electric Company, Erie, Pa.

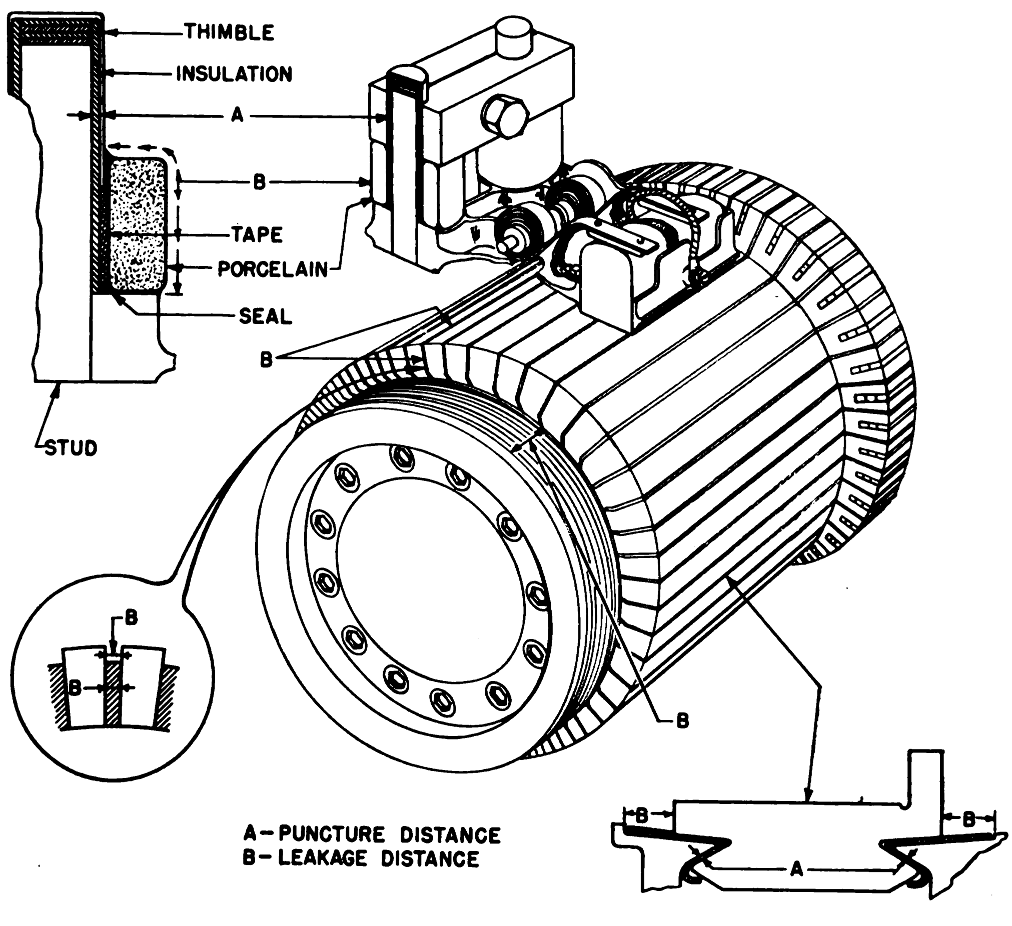


Fig. 1—Details of brush-holder and commutator insulation

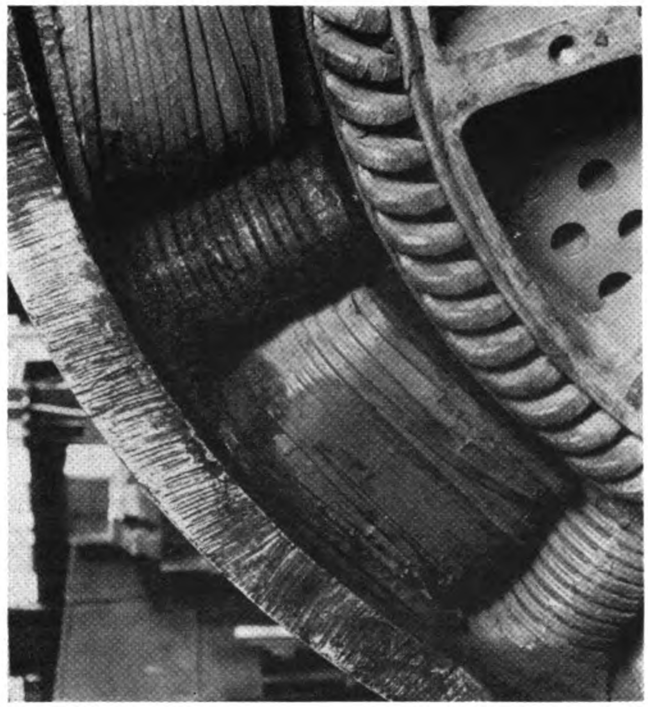


Fig. 2—Accumulation of oil and dirt on generator field coils

chine. This has to be divided between copper, iron and insulation. Since it is electricity that transmits the power to pull trains, we try to get all the space we can for copper and iron. This is another reason for not using any more insulation than necessary.

Although it doesn't take much insulation to hold electricity in, what there is must be o.k. The maintainer's job is to keep this insulation in good condition so it can do its work well. Now, let's look at the job insulation has and see some of the things that may happen to it.

Electricity's Traffic Cop

Motors and generators depend upon the flow of current through their field and armature coils where the work is done. Insulation keeps this current in the circuits leading to these coils. It also separates the turns of the coils so that the current must go around each turn. This makes the current do its magnetizing job. When the insulation fails, the current short-cuts across the turns. Then it doesn't do its job, and we have what is called a "short circuit". If the insulation fails in a way that lets current escape to the machine parts which are not in the regular electric circuit, we have what is called a "ground." This means that current gets into parts connecting with the earth or ground.

What Makes It Fail?

"How and why does insulation fail", you may ask, "and what can I do about it?" The two more common forms of insulation failure are puncture and leakage, and sometimes a combination of both.

Puncture: Insulation has very good resistance to puncture. However, if the voltage (electrical pressure) is high enough, it can break through the insulation just as water or steam can burst a pipe. Good insulation will hold a pressure of several hundred volts on a wall only one thousandth of an inch thick. This is fine, for it allows most of the circuits inside a machine to be completely enclosed by insulation thick enough to hold the electricity in, but thin enough to let the heat out. What's more, today's insulating materials keep their puncture strength for years of regular duty. Then why worry about insulation at all?

One reason is the danger of mechanical damage. Because insulating materials are mechanically weak, the thin layers used are easily damaged. Careless handling of tools, or parts, may cut or puncture the insulation. Loose coils on poles shake and wear their insulation. Relaxed armature bands let coils buzz and wear through. Vibration from bad gearing or a rough engine seeks out and punishes any insulation that is free to chafe. Rough cleaning treatment, or prolonged soaking in strong solutions may be harmful, both mechanically and electrically. Dirty or loose terminal connections get hot and char the insulation on the conductor. Using flame to thaw out steam or air pipes that are near conduits carrying electric wiring may burn cable insulation. From these examples, you can see that damage is a greater enemy of insulation than is puncture by any operating voltage. So if you keep damage off the job, the insulation built into the machine will keep electricity on the job.

Leakage: While most of the conductors in a machine are completely enclosed with insulation, there are certain parts that must be left exposed. An example is the commutator surface and brushes (Fig. 1), which must make sliding electric contact with each other. How to keep electricity from escaping at these exposed places is a problem especially worth understanding. At such points, the current is no longer walled in. Hence, it can leak or "creep" away through any conducting material that

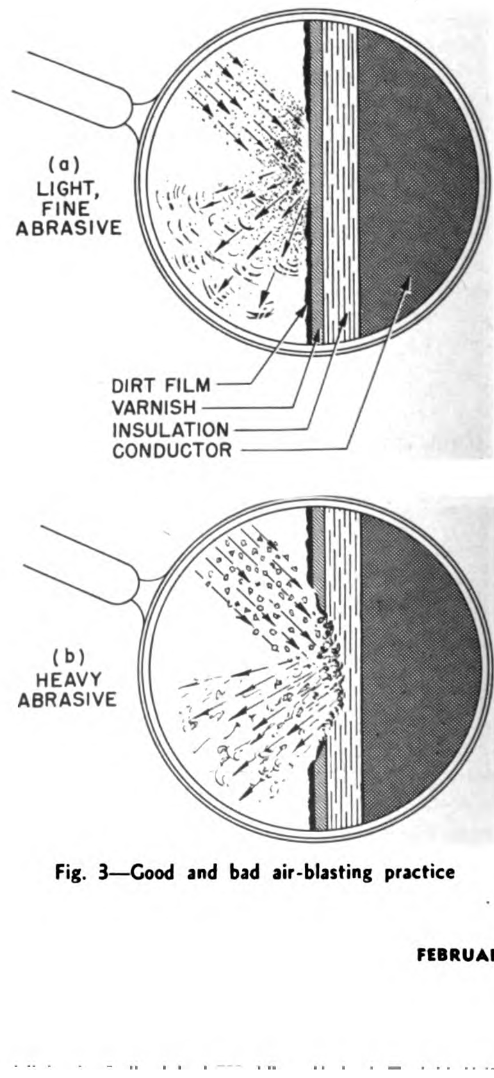


Fig. 3—Good and bad air-blasting practice

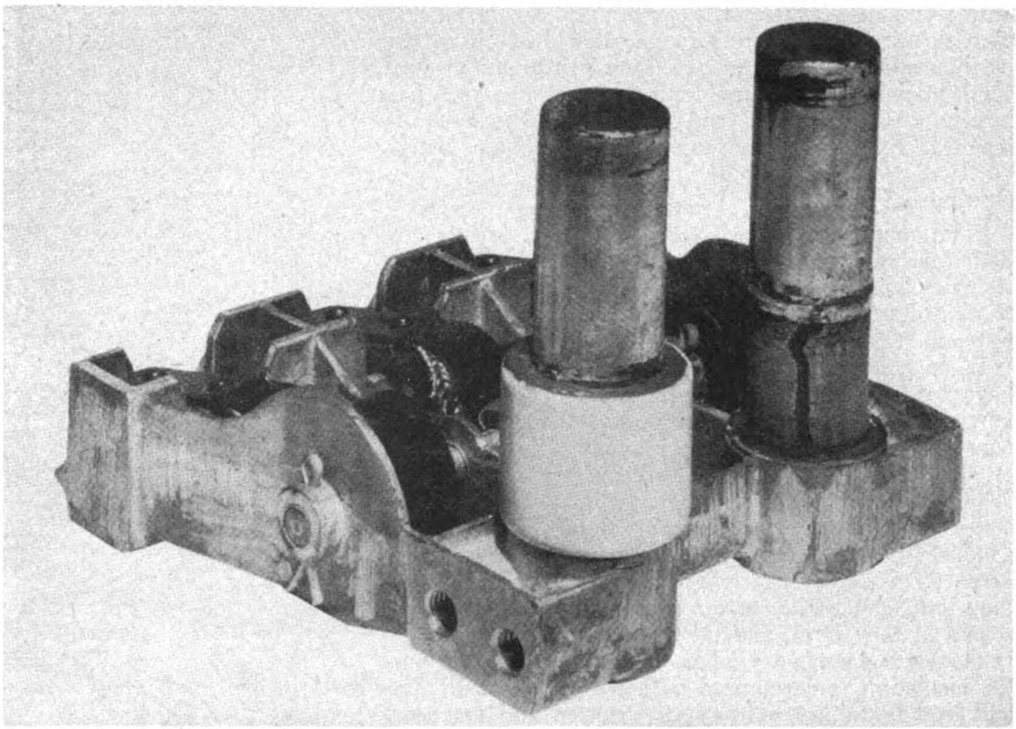


Fig. 4—Tracking of brush-holder insulation due to leakage under porcelain sleeve

comes close enough to provide an escape path. To guard against this leakage, the puncture insulation is extended over the nearest part, offering such a path. Now the current must either jump through a long air space or manage somehow to creep over this extended insulation surface in order to escape. But air is a good insulator, so if you keep conducting material off the extended insulation (leakage) surface, the problem is solved. But, locomotive operation takes insulation through all kinds of conditions, summer and winter, which affect this maintenance. job.

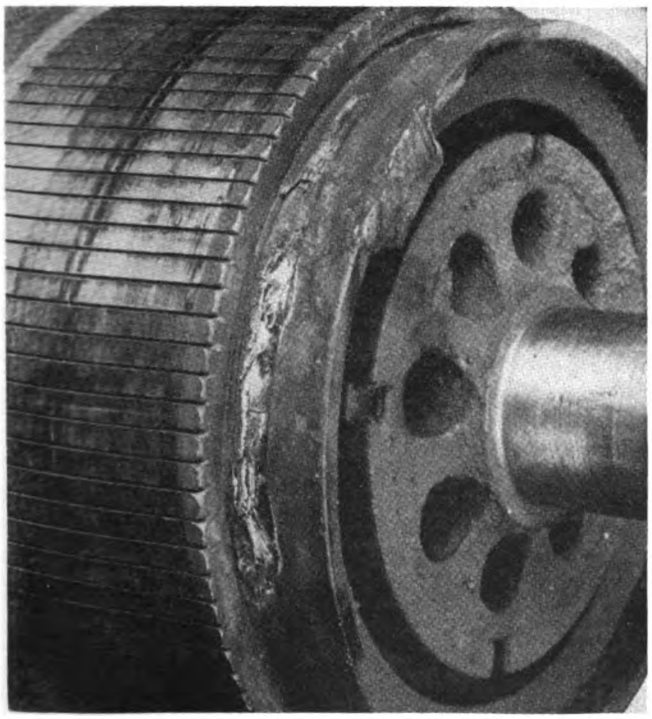


Fig. 5—Failure of commutator string band on a generator as a result of leakage

Dust Is Your Enemy

Railroad dust is a good electrical conductor because it contains lots of particles worn from wheels and brake shoes, as well as carbon in several forms. As these conducting specks settle on the leakage surface, the air spaces between them get smaller and smaller. Finally, current begins to escape by creeping from speck to speck. You can see how this happens if you think of using stepping stones to cross a stream of water. Even a wide stream can be crossed if you throw in enough stones. Of course, such a path is not like a solid bridge. Only a little current can escape across it at first. You can sometimes see the escape path by the twinkling glow of the tiny sparks.

Maybe such a small thing doesn't seem worth worrying about, but be careful! Electric sparks are very hot—like arc welding or lightning on a small scale. If not checked, these sparks will burn the insulation surface and form a carbonized path. Then the current doesn't have to jump from speck to speck. It begins to flow steadily over the charred surface. As it flows it forms a hotter and bigger path. If a ground relay doesn't trip or a cleaning job come to the rescue, the entire power of the machine will eventually blow through to a failure.

The longer the leakage distance, the more dirt and voltage it takes to span it. But, of course, a machine can't be all leakage distance. Many years of maintenance experience have shown just about the right balance of space between leakage distance and the other working parts of a motor or generator. When dirt conditions are worse than average, these surfaces must be cleaned oftener to keep them effective. Smooth, glossy surfaces collect less dirt and are easier to clean. To keep leakage surfaces good: First, keep as much dirt as possible out of the machines. Maintaining engine room air filters in good condition helps reduce the dirt in the ventilating air.

Next, do a thorough job of getting rid of what dirt

does get in. Remember the leakage surfaces during regular cleaning when you blow the dry dust out of the machines. Blow with a purpose, not just to stir up dust. Engine-driven generators and exciters can be kept turning during blowing. In this way, all surfaces can be reached, and the machine fans will help expel the dust.

Beware of Moisture

Solid conducting particles are not all that form escape paths across insulation. Water, with conducting material dissolved in it, will readily carry current. An illustration of this is the way current flows through the acid-water mixture in a storage battery.

When a leakage surface gets wet, the current doesn't have to try to jump through the air spaces between particles. It can get across through the water. In fact, current can then bridge gaps impossible for it to cross on dry insulation. Trouble begins if the film of water is carrying current when it starts to dry up. This drying may be by natural evaporation or by heat, if the path is conducting enough current. The surface does not dry all at once. Tiny dry spaces form here and there between the wet patches. The current easily jumps these little dry spaces as they form, and the sparks char the insulation. If the water doesn't dry off faster than these sparks burn the insulation, a carbonized path will be formed. This will lead to failure unless it is detected and corrected.

Moisture has a way of soaking into tiny spaces that dry dust alone could not penetrate. It seeks out pinholes and cracks to start leakage paths in insulation that would be perfectly safe if dry. That's why you should be cautious about applying power or making high-potential tests on wet machines. The insulation should be dried out first. This can sometimes be a problem.

When a cold machine is moved into a warm shop or enginehouse, it breaks into a sweat. Moisture froms on it just as drops of water collect on the outside of a glass of ice water on a hot day. Or the machine may have run through a severe snow or rain storm and soaked the insulation without being hot enough to dry the moisture off as it came through. If left in the warm enginehouse, the machine may dry out in time. Or a blast of hot air can be blown through it to speed up the drying. A generator can be short circuited with a temporary connection and then driven at low excitation to get it hot. The short circuit will allow a high heating current and, at the same time, keep the voltage low.

Another Bad Actor

Dry dust and moisture are not the only enemies of insulation. Diesel engines and air compressors like to splash and blow around in oil. They have a generous way of sharing it with everything in the engine room—even the insulation of the electric machines. While clean oil is a good insulator, it is also a good dirt collector. Oil fumes, or even solid droplets, in the engine room air deposit a thin film of oil on insulation. This makes the surface sticky, and when dirt particles fall on it, no amount of blowing can get them off. The deposit gets thicker and thicker. It builds up against field coils, in corners and over to terminals (Fig. 2), until a leakage path is formed. Then it settles down to glow and burn, just as in any other leakage failure. Like water, oil has a way of finding and seeping into pin holes and cracks in the insulation.

Such mucky dirt must be washed away with a solvent. The perfect solvent evaporates rapidly, without leaving a conducting residue. It doesn't harm the insulation,

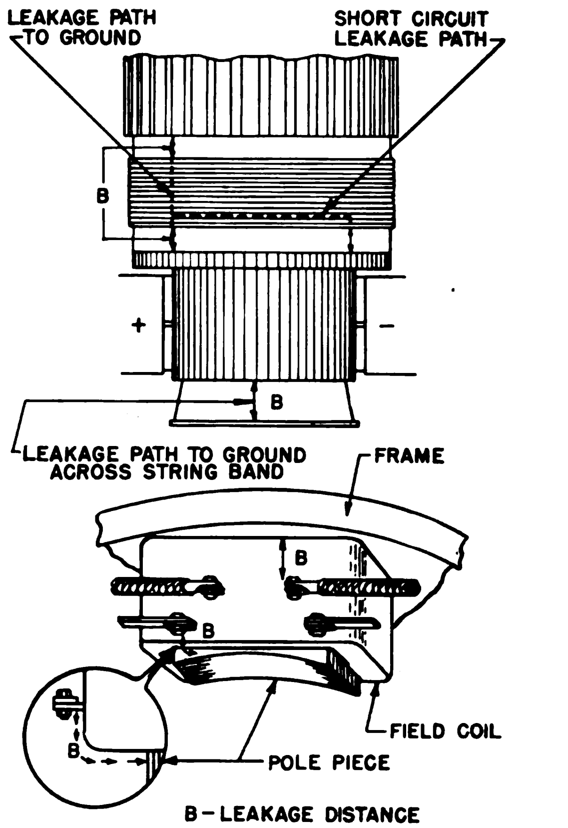


Fig. 6—Typical leakage surfaces on armatures and fields

will not burn or explode, and is not poisonous. No one has yet found this perfect solvent, but a number of good ones are in use.

Carbon tetrachloride comes close to filling the bill, except that it must be used with care. Precautions must be taken to guard against personal injury, especially from breathing the fumes. Perchlorethylene is not as poisonous, but any of these good cleaners must be used with caution—just like fire or electricity. Follow carefully the instructions worked out by your Safety Committee experts for your own good. Do not use more solvent than necessary, and provide good drainage so that it doesn't float the dirt to a place where it will do more harm. Where possible, it may be a good bet to wipe with the solution instead of washing or spraying.

Locomotive "Traffic Film"

Our last trouble maker—and probably the most difficult to remove—is a smoke-like deposit of fine carbon. It does not blow or wash off. It is like the "traffic film" on your car. If you squirt the body with a hose, it looks clean while it is wet, but as soon as it dries, it is as dull and grimy as ever. The only way to get the stuff off is by scrubbing. As you know by experience, you've got to lay hands on it. This is all right as long as you can get at these grimy surfaces. Some, however, are hard to reach, such as the pockets between coils at the end of the armature slots, or behind commutator ears or risers. Here is a good place to use an abrasive blast. Like any powerful tool, it must be handled with caution and full understanding of what it does. Otherwise, you can do more harm than good with it. Heavy, abrasive particles driven by a powerful air jet will not stop after removing the dirt. They will cut through the protective varnish coat and rip the insulation to shreds (Fig.

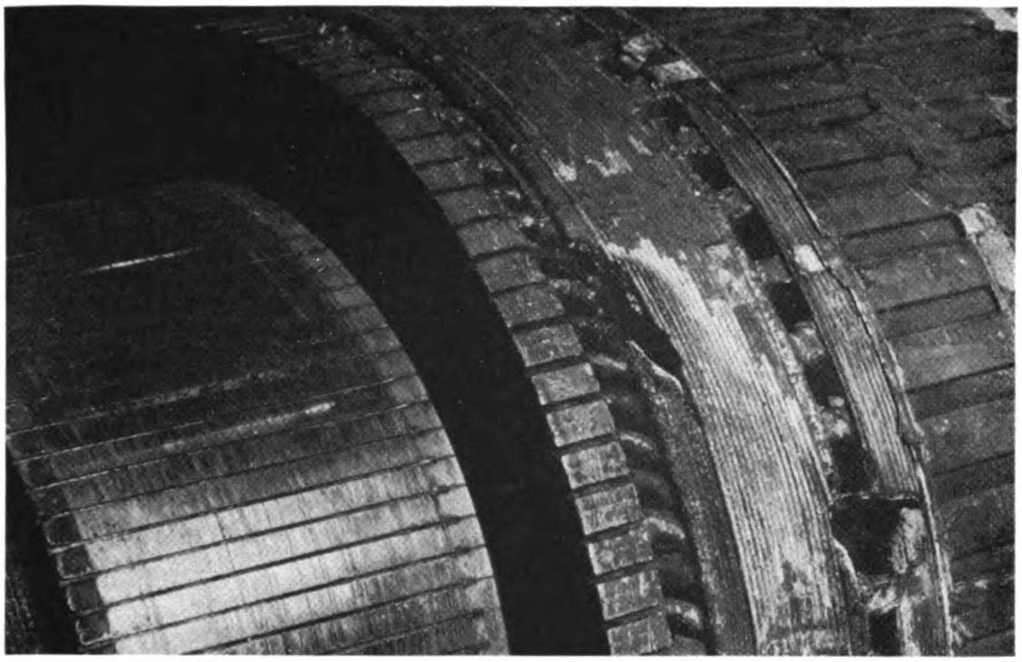


Fig. 7 — Generator armature bands burned by short circuit currents

3b). Heavy, soft, sponge-like pellets driven at high speed will pound a surface. Maybe they won't cut, but they will loosen the bond between the layers of insulation.

Because this dirt forms only in a fine layer, a very light flour-like abrasive is all that is needed (Fig. 3a). Driven at moderate speed with usual shop air pressure (90-100 lb.), it will give a cleaning heat that cuts fast enough to control without doing any harm. Don't make the mistake of blowing a solid stream of abrasive. Cut it down so only a fine, barely visible dust shows. Let the air do most of the work. Above all, study and understand what you are using and what it is doing. Don't think only of the present cleaning job. Remember what effect your present action may have on the future operation of the machine—you don't want to cause a rebuilding job. Protect yourself too; be sure to wear a respirator.

You Can't Cover Up

There is a strong temptation to paint insulation instead of cleaning it. This may make a nice looking job, but it doesn't fool the electricity. Don't think you can get away with it. Painting dirty insulation is the worst possible thing you can do. The layer of conducting dirt is still there, although covered up with shiny, new paint. The current leaks through it just the same, only now with the paint over it no one can get at it to clean it off. The backshop will find you out when they strip the machine down to rebuild it after it blows up.

If there isn't time for a good cleaning job, it is much better to let the machine go without painting. Then you have a chance of improving it next time. Be wary of insulation that looks dirty, but measures good. Don't paint it. Remember that wiping only a small gap across an otherwise dirty leakage surface is enough to give a good megger reading. Such a small gap will fill with dirt much faster than if the entire leakage surface were properly cleaned.

Points to Watch

A machine has many leakage surfaces all of which are important to its proper operation. Let's look at some that you will usually be working with. One is the leakage surface from the machine terminals along the cables to the point where they are cleated. Another is from brush holder terminals along the cables or connection rings to the point where these are cleated to the frame.

The brush holder itself is insulated from the clamp or support that holds it to the machine frame, as detailed in Fig. 1. In this typical case it is done by an insulating tube over the brush holder stud. Note that the puncture thickness of this tube is small as compared with the long leakage distance from the clamp to the brush holder. A metal thimble is slipped over this tube to protect the clamped portion, and a porcelain sleeve is used to protect the exposed portion. Porcelain is used because it has a hard, smooth, easily cleaned surface. The space between the tube and the porcelain must be well sealed to keep moisture out. Sometimes, to get a tight fit, the tube is wrapped with a tape and then the porcelain is pushed over it. If this joint is not thoroughly filled with varnish or if the porcelain is broken, the tape will soak up water like a wick and form a leakage path on the surface of the insulating tube (Fig. 4).

The string band over the commutator cone protects the mica and prevents it from flaking off. Since this is a leakage surface, the string should be tight, be filled with varnish, and have a smooth surface finish. It the band is loose, dirt will collect under it. Then a leakage path will be formed, even though the outside surface looks good (Fig. 5).

Did you ever think of the side mica in a commutator as a leakage distance between segments? Fig. 1 shows it is, and that is why it is so much thicker than required for the puncture voltage. Keep this surface clean.

Don't forget the steel bands on the armature—especially at the commutator end. The current tried to leak along the path shown in Fig. 6, from the riser at one brush holder position across the armature surfect to the band, then through the band and back across the armature surface to the riser at the next brush holder position. If this happens, the short-circuit current can burn the band off (Fig. 7). This will wreck the armature so that it may slide the wheels. Another path to ground is from the commutator riser across the armature surface

to the band, and from the band across the short distance to the core.

Not all leakage surfaces are on the armature. Field coils have leakage distance from the terminals across the insulation to the pole piece or the frame (Fig. 6). So it goes, from one part of the machine to another, and all these points are important to watch.

Forestalling Trouble

Leakage and puncture are the long and short of insulation. Don't get them mixed up. You will have a lot more to do with leakage than with puncture. Remember that no matter how thick and strong the insulation is, it fails if there is a leakage patch across it. A strong wall means nothing when you put a ladder against it. Any conducting material is all the ladder electricity needs. Keeping dirt off the job is a fine way to keep your machines on the job. If you think of what insulation is, and what it is supposed to do, you will be able to handle it intelligently. The result will be less work and trouble for you in the long run, and more service from the equipment on the road.

Diesel Load Tester On the Southern Pacific

The Southern Pacific has installed water-rheostat diesel-load-test equipment at the Sacramento, Calif., shops which is neat in appearance, convenient and effective in use and well guarded to assure against accidental electric shock to workmen. The tester is located just outside of former pit No. 1 in a steam locomotive repair shop building, one end of which has been converted for handling diesel engine repairs. The safety feature mentioned consists of a wood frame and steel wire mesh fence, 6 ft. high, extending around the tester, as illustrated.

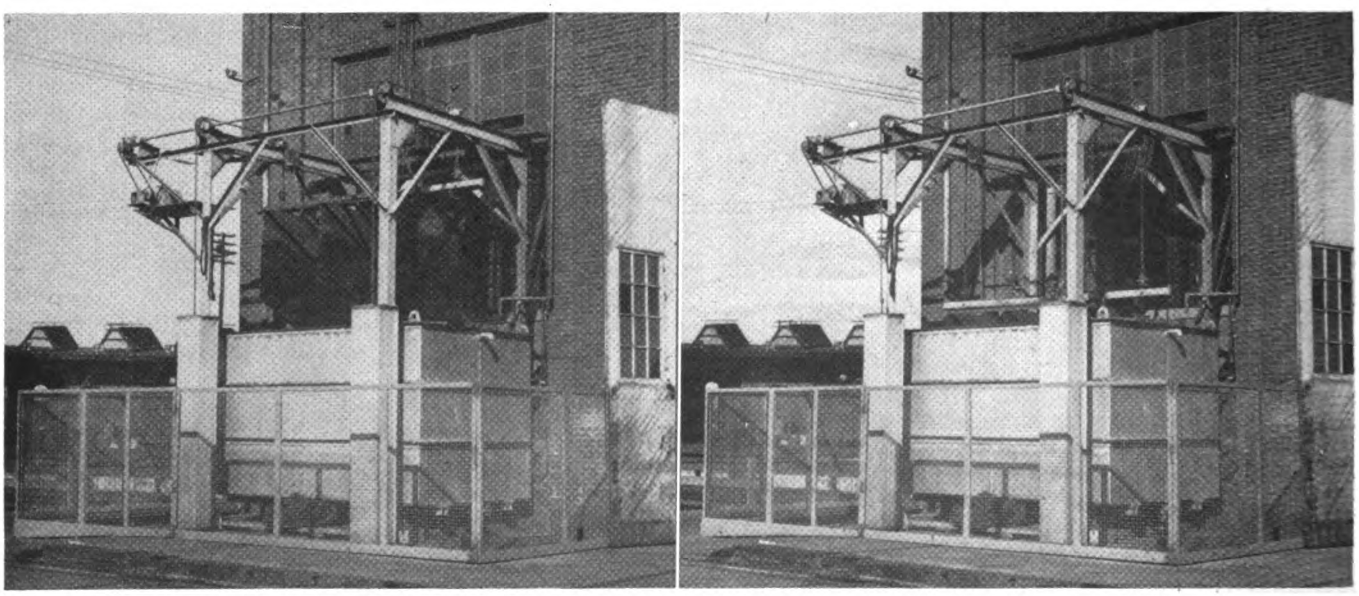
The rheostat consists of a steel tank, 12 ft. long, by 8 ft. wide, by 7 ft. high, made of 1/4-in. plate, reinforced with 3 1/2-in. angles and mounted on double rail sections which in turn are supported by 8 high-compression (10,000-lb.) outdoor insulators, resting on a heavy channel-iron base. These insulators, 7 1/2 in. high by 4 1/4 in. in diameter are equally spaced under the tank and separated from the supporting rail sections and base channels by 1/8-in. thick sheet lead pads, top and bottom. The tank itself is thus thoroughly insulated from the ground.

The steel structure, built around the tank and extending above it, as illustrated, consists of 6-in. angles and 7-in. top channels, suitably stiffened with diagonal braces and provided with motor-driven equipment for raising or lowering the counterbalanced heavy steel positive plates which are immersed in the tank as necessary to meet varying load requirements for the diesel-electric power set being tested. There are three of these steel positive plates, made of 3/8-in. material, 6 ft. wide and of varying lengths, the center one being 6 ft. 8 in. long, and the two outside ones 6 ft. 3 in. and 5 ft. 9 in. long respectively.

The lower ends of the positive plates are tapered the same as corresponding small negative plates 15 in. high, suitably positioned and welded in the bottom of the tank. The positive plates are spaced 3 ft. 4 in. apart and rigidly secured at the top to two 4-in. angles which are 12 ft. 8 in. long, or long enough to extend over the tank ends and support the positive plates a fixed distance from the bottom negative plates when in the extreme lower position. In this position, the 4-in. angles are insulated from the tank ends by 3-in. square creosoted wood blocks.

The two positive-plate supporting chains extend over four pulleys and down to counterweights which operate vertically in the rectangular housings shown close to the guard fence. The two outer pulleys are mounted on a single shaft with 5-ft. extension at one end for double V-belt and worm gear drive from a 3-hp. synchronous electric motor shown in the illustration.

This water rheostat is used for load testing the diesel engines and generators in all types of diesel locomotives. The load is regulated by the depth of the positive plates in the negative tank. A salt solution of from 3 to 20 lb. of salt to a tank of water is used, the amount of salt depending on the size of the engine and being less for the larger engines. At present, the rheostat is used for loads up to 2,000 hp. with voltages up to 1,000.



Water rheostat at S. P. shops, Sacramento, Cal. Positive plates in raised position (left) and lowered (right)

CONSULTING DEPARTMENT

Cleaning and Testing of Locomotive Electrical Equipment*

Questions and Answers

Q.—How can radiator cooling fan alternating current motors be tested to anticipate failure? What causes failure of these motors?

A.—There is a divided committee experience on this matter and opinions are listed in order below:

1.—Failure of these motors is caused most often by their being reversed suddenly. This occurs because in the sequence of operation of the motors, first one picks up, or starts, and in pulling air through a radiator box, which is common to all fans, the other fans will start to turn backwards. Then, when the second fan is required for cooling, it is energized and suddenly reverses.

2.—The type of alternating current motors generally applied to radiator cooling fan service is comparable to that used in industrial application. Owing to the nature of the service, it is debatable as to whether better types of insulation, major and minor, should not be used in such service. The major deficiency in insulation of these motors, which results in failures, other than those originating from improper phase operation, can no doubt be indicated by the application of the surge test principle. We are anxious to learn to what extent this principle of test has been applied to induction motors in locomotive service. Other than tests of this nature, and dielectric absorption tests with Megger testers, we know of no way of obtaining a measure of anticipated insulation life.

3.—Motors are tested with an ammeter to check current draw. We have had a considerable number of cooling fan alternating motors fail on our railroad, and the majority of these failures have been traced back to single phasing. In a majority of the cases, the trouble was found in the plug receptacle; either a poor contact or a loose connection. Loose connections on the a.c. contactors themselves may also cause trouble.

4.—We are not acquainted with a method of testing radiator cooling fan motors to anticipate failure. A number of failures of these motors, which occured during winter operation were apparently caused by snow and ice collecting and freezing around the fans when they were not operating. This resuted in an overloaded condition, and subsequent failure when the fan was brought into operation. On these particular E.M.D. units no overload protection has been applied to the radiator cooling fan motors by the builder. We have requested that overload protection be applied to these motors on new units being delivered.

5.—The cooling fan alternating current motors can be checked with respect to their resistance to ground and for normal rotation. These motors should also be visually examined for any evidence of heating around bearing housings. Failures of radiator cooling fan a.c. motors are very unusual.

6.—Cooling fan alternating motors can be tested to anticipate failure the same as any other alternating motor; namely, by testing between phases, and making insulation tests to ground. It is our belief that most a.c. cooling fan motor failures occur from short circuits between phases, due to breakdown of insulation. There have been some failures due to motors becoming single-phased from failure of one of the contacts on the contactor.

7.—Test frequently for grounds and loose connections; also give the motor contactors special attention and maintenance to see that all three-phase contact fingers close. Failure of the a.c. current fan motors is caused by locked bearings, the rotor not turning, and single phasing caused by poor operation of contactor fingers.

* Material presented by the Diesel Electrical Committee at the annual meeting of the Locomotive Maintenance Officers Association held in Chicago, September 17-19, 1951

Diesel Electric Locomotive Batteries

Questions and Answers

Q.—How should battery hydrometer readings be made?

A.—Unless a uniform method is used, a wide variety of results may be obtained from hydrometer readings taken by different men from the same electrolyte. The following procedure is suggested by the Electric Storage Battery Company:

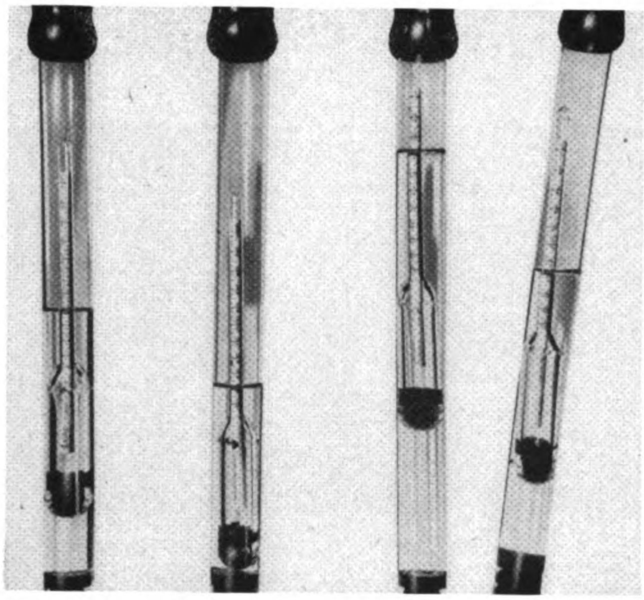
Enough electrolyte should be drawn off to fill the barrel of the syringe to a level which will permit the hydrometer to float freely without touching the barrel at either top or bottom. Correct and incorrect techniques are shown in the figure. The rubber bulb should be allowed to expand completely and the syringe should be held by the neck of the bulb.

Shake the syringe gently to be sure the hydrometer is floating freely. Hold the syringe at eye level. The point at which the electrolyte level appears to intersect the stem of the hydrometer, will indicate the specific gravity readings to be recorded.

Empty the hydrometer syringe completely, making certain that the electrolyte is returned to the same cell from which it was taken. A clean accurate hydrometer syringe must be used. It must be disassembled and washed thoroughly at least once a month.

Avoid any dripping of electrolyte from the hydrometer syringe.

To insure accuracy when water is added, hydrometer



Right and wrong hydrometer positions for specific gravity readings. (Left to right)—hydrometer floating freely in barrel permitting correct reading; insufficient amount of electrolyte makes float rest on bottom of barrel; too much electrolyte makes float touch top of barrel; syringe held at an angle causes float to stick to barrel

readings should be taken before adding water. Water is lighter than electrolyte and will float on top of the electrolyte when added. A day or two is required for water and electrolyte to mix thoroughly, after which hydrometer readings may be assumed to be accurate again.

The fully charged specific gravity varies in different types of batteries and is shown on the battery nameplate. The discharged specific gravity (not shown on the battery nameplate) also varies with the battery type, but is usually around 130 to 140 points lower than the fully charged specific gravity.

The specific gravity, or hydrometer reading, of the electrolyte lowers on discharge and rises again on charge. Consequently, if we know the specific gravity, temperature and height of electrolyte above the splash cover, we can estimate the approximate state of charge, provided that no electrolyte has been lost or added to the cells.

A specific gravity reading 100 points below the full charge value is a warning not only that the battery needs immediate charging, but that the charging equipment probably has failed in some way and should be checked.

The fully charged specific gravity of electrolyte in new batteries is adjusted within the limits shown on the nameplate, and should not require adjusting during the life of the battery, unless electrolyte is actually lost or spilled.

Replacement of spillage should only be made in regular battery shops.

Q.—What accessories are required for battery maintenance?

A.—These are accessories recommended by the Electric Storage Battery Company:

VOLTMETER.—The voltmeter used for checking voltage regulators should have a scale that can be read accurately and easily between 129 and 130 volts.

The same voltmeter can be used for checking individual cell voltages if it has an independent tree-volt scale so that it can be read easily in hundredths of a volt. Accuracy should be within one per cent.

To insure their accuracy, voltmeters should be compared at least twice a year with a standard meter (kept only for checking purposes).

HYDROMETER SYRINGE.—Use a clean, accurate hydrometer syringe for taking specfiic gravity readings.

An 18-in. soft rubber extension with a bent hard rubber measuring nozzle, is a handy addition for reaching otherwise inaccessible vent openings. It is used to measure the height of electolyte, and to take readings of cells in the rear of 4-cell trays where compartments have low overhead space.

HYDROMETER SYRINGE HOLDER.—If the hydrometer syringes are carried on the locomotive, it is suggested that a hydrometer syringe holder, such as the Exide No. 21070, be installed close to the battery. Use of this device will lessen syringe breakage.

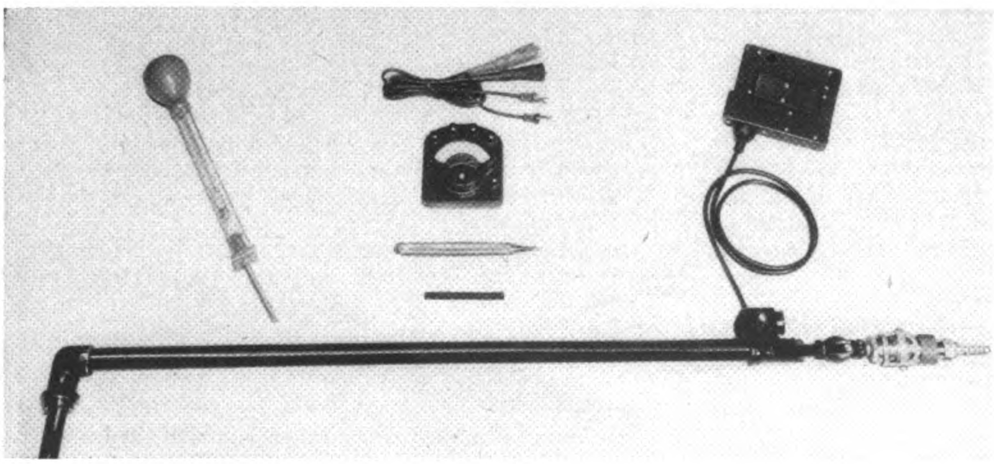
THERMOMETER.—For taking the temperature of electrolyte, use an accurate thermometer. The Exide thermometer also shows hydrometer reading corrections necessary for any temperature of the electrolyte.

ROTATING VENT PLUGS.—A special white porcelain vent plug is suggested for this purpose.

CELL FILLER.—It is recommended that an automatic cell filler be used for adding water to batteries.

LIFTING RIG.—When the design and location of the battery compartment makes necessary the installation and removal of the trays or containers from the top of the compartment, an adequate lifting device should be used.

S. K. LESSEY
The Electric Storage Battery Company



Accessories for locomotive battery maintenance include an automatic cell filler, electrolyte thermometer, a hydrometer syringe and a voltmeter

EDITORIALS

Invention and The Laboratory

One consideration which has long been a hindrance to the advancement of standardization is the fear of the tendency toward stagnation which was characteristic of some early standardization programs. The equipment standardization of the Harriman Lines early in the twentieth century is a case in point. Not only were locomotive classes reduced to the minimum which could meet the needs of the system, but parts were extensively standardized between classes of locomotivs to a point where many thought that the best proportions for each class were sacrificed in the interest of making one style and one set of dimensions for each part fit as nearly all classes of locomotives as physical limitations would permit.

The theory back of this fear was that progress depended upon the invention of improved types of parts or details of design, through which process reliability or operating efficiency or cost of maintenance could be improved. Then, and for some years thereafter, such improvements in design depended upon the exercise of genius on the part of the designer, based upon his experience and the fertility of his imagination. Most of the basic features of today's rolling stock—couplers, air brakes, draft gears, most truck details, and car structures, particularly those of freight cars—were evolved through this process. It is true that, once these things, most of them proprietary, had taken form, they became the objects of intensive refinement by the companies marketing them and in this way vast improvements have been effected. As far as it goes, there can be no substitute for this process.

A significant change has taken place in the conditions affecting the development of industrial products during the last quarter of a century, however. It was during that period that research in pure science, particularly in applied science, became a dominant feature in determining the character of industrial products. While invention is still a factor in the process, and probably always will be, operating experience and genius are no longer adequate qualifications to support invention. The day of hunches and conclusions based on reasoning from purely empirical premises is over. As the period of development of basic designs has given way to that of refinement, extensive reservoirs of specialized knowledge have been developed through research. The need for further knowledge is never satisfied and, as time goes on, it can only be satisfied by more and more intensive research. Thus the laboratory has become an essential factor in the inventive process.

As the fields of industrial research have widened, the need for it in the railroad field has spread beyond the builder or supplier of materials and equipment to the user as well. The cost of such research is too great to permit much of it to be carried on except on an industry-wide basis. The results already attained by the railroads through the A.A.R., both with respect to track and rolling stock, have been such as to insure its extension.

As industry-wide research projects furnish accurate factual answers to more and more problems, the one best solution in each case will establish a new standard. Standards thus established become signs of progress, not of stagnation.

Standardization for Electric Traction

There is much that is significant in the development of two new types of electric locomotives recently placed in service by the Pennsylvania. Both types take power from an 11,000-volt, 25-cycle overhead contact system. One type, designed by the General Electric Company, and described in this issue, employs a newly-developed series a.c. motor which is capable of delivering more power at lower motor speeds than other motors of this type, and making the locomotive better suited to freight service. The other type of locomotive, designed by the Westinghouse Electric Corporation is a rectifier type which employs a transformer and sealed Ignitron mercury-arc rectifiers to produce direct current for the traction motors. These locomotives will be described in an early issue of *Railway Mechanical and Electrical Engineer.*

Railroad representatives state that to date both types of locomotives have indicated that they are capable of hauling freight more efficiently than the older electric locomotives or than a diesel-electric locomotive of comparable size. Between the manufacturers' representatives, there is much contention as to which is the better locomotive, but these arguments lose much of their force when the railroad points out that the two are not really comparable.

The significance of the situation is this. Many different types of electrification and many more types of electric locomotives are in service all over the world. Practically all of them have been able to turn in a respectable performance record. Some improvement, perhaps ten per cent, might be made by changing our present power systems or locomotives to some other type. A much greater

improvement, let us say 30 per cent, could be effected by greater standardization, permitting greater quantity production of parts and more interchangeability of motive power. The diesel-electric locomotive has demonstrated both of these factors most effectively.

If straight electrification is again to find a place in this country, its reinstatement will be hastened by a reduction of costs. Some 70 per cent of our electric motive power now operates under high-voltage a.c. contact systems. Since all systems work, should this not now be regarded as American standard, permitting further development to start from this point? Unquestionably, in the early days, electric traction was considerably retarded by "The Battle of the Systems." If the manufacturers could not agree on a power system, what could the railroads think of the idea of electrification as a whole?

Beginning from there, all the necessary types of motive power are available. A.C. series motors have proven their adaptability to both locomotives and multiple unit cars. the rectifier is in service on an m.u. car and on locomotives. Those who prefer motor-generator type locomotives can have them if they wish.

Contact system power at 50 cycles is being tried in Europe. It has been proposed that we might use our present standard of 60 cycles in this country. It does not seem to have too much in its favor since power companies would probably object to supplying single-phase power, but it could be applied to the same type of contact system.

The diesel has found favor because of its high efficiency and, in relation to straight electrification, for its ability to go anywhere without an overhead wire, and because large initial investments for power distribution are not required. If electrification ever comes back in volume in this country, it will be because of a considerable increase in the price of oil in comparison with the price of electric power. Such a return will be hastened if agreement on power supply is accepted and progress toward standardization of equipment can be assured.

What Ten Years Can Do?

Speculation on the future is always interesting and there are those who today are watching the trend of motive power changes that wonder just where the replacement of steam power by diesel-electric is going to bring us out five or ten years from now. In the absence of any predictions it is possible that an examination of the statistics of motive power for the last ten years may serve as the basis for estimates of future possibilities.

The accompanying table of locomotive ownership has been prepared to show the changes that have actually taken place between 1941 and 1951 and the changes during the year 1951. These figures give a brief picture of the ownership situation as of Jan. 1 of this year and it is interesting to note that while there are 12,326 diesel powered locomotives, composed of 17,619 units, there are still 21,200 steam locomotives on the Class I railroads, a decrease of 18,655 since Jan. 1, 1941.

More interesting still are the performance figures which now show, as of October 1951, that in freight service the diesel is handling 50 per cent of the locomotive mileage as against 48 per cent for steam. In passenger service it is 63 per cent for diesel and 30 per cent for steam and in yard switching service it is 61 per cent of the yard switching hours for the diesel and practically all of the remainder for steam power.

Once again it is worth while to call attention to the fact that there are still 21,200 steam locomotives left and for those that are looking forward to the day when all the steam locomotives are gone the fact should be borne in mind that the replacement ratio is changing all the time. In the case of switchers 6,088 diesel switchers have been installed in 11 years and 3,715 steam switchers have been retired—but there are still 3,531 steam switchers left. In this case it has not been entirely a job of replacing steam by diesel for as the diesel switcher came into the field its usefulness, coupled with increases in traffic developed many new uses for the diesel electric type of switcher so that if and when all of the steam switchers are replaced by diesel-electrics there will probably be several hundred more locomotives of this latter type than there were originally steam. This, too, is worth keeping in mind.

OWNERSHIP OF MOTIVE POWER

	Jan. 1, 1952	Jan. 1, 1951	Jan. 1, 1941
STEAM LOCOMOTIVES			
Passenger	3,106	3,791	6,921
Freight	13,644	16,214	24,588
Pass. or Freight	919	1,093	1,200
Switch	3,531	4,167	7,246
TOTAL	21,200	25,265	39,855
DIESEL ELECTRIC			
Passenger	1,200	953	116
Freight	3,814	2,698	11
Pass. or Freight	536	366	0
Switch	6,776	5,813	688
TOTAL LOCOS.	12,326	9,830	815
TOTAL UNITS	17,619	14,160	(*)

* Data not available.

These statistics are offered for whatever value they may be. There are many people who already have observed that the rapid installation of diesel power is creating a situation where, at some not too distant date a peak will have been reached in the installation of diesel power. Many estimates have been made and some are willing to venture the prediction that when the replacement of steam by diesel is complete—this is not a prediction that there will be *no* steam locomotives left in service—there will be somewhere between 25 and 30 thousand diesel units.

This guess ignores factors which do not seem to be too clear at the moment—the question of railroad traffic, the increasing age of diesel power and the ability of the railroads to get more service out of each individual unit than they already have done. There is also the ever-present possibility that some new type of motive power, be it gas turbine, atomic locomotive or whatever the future may bring, may break upon the scene as did the diesel-electric and upset all of the statistics once again.

Anti-Corrosion Metal Wash Primer

Produced by the Vorac Co., Rutherford, N. J., this primer, based on Vinylite resins, fills a need for military and civilian production and can be used under practically all types of coatings. The wash primer, designated Vorac H-400 by its manufacturer, requires no oxidation or polymerization, as films are formed by the evaporation of the solvents.

A zinc chromate compound, Vinylite resin-base wash, is designed to provide an adherent base coating on most metals and alloys. It is a metal conditioner, as well as primer, applied only to clean surfaces since it does not replace degreasing or sand blasting. The compound does, however, replace phosphate treatment and should not be applied over a phosphated surface.

Wash primer is always employed in conjunction with one or more top coats. Used as soon as possible following metal cleaning, the primer which dries in less than 30 min. will for a time prevent rusting under usual weather conditions. The composition is supplied in two parts for mixing at the time of use. It is applied by dipping, brush or spray, depending on the objects to be coated.

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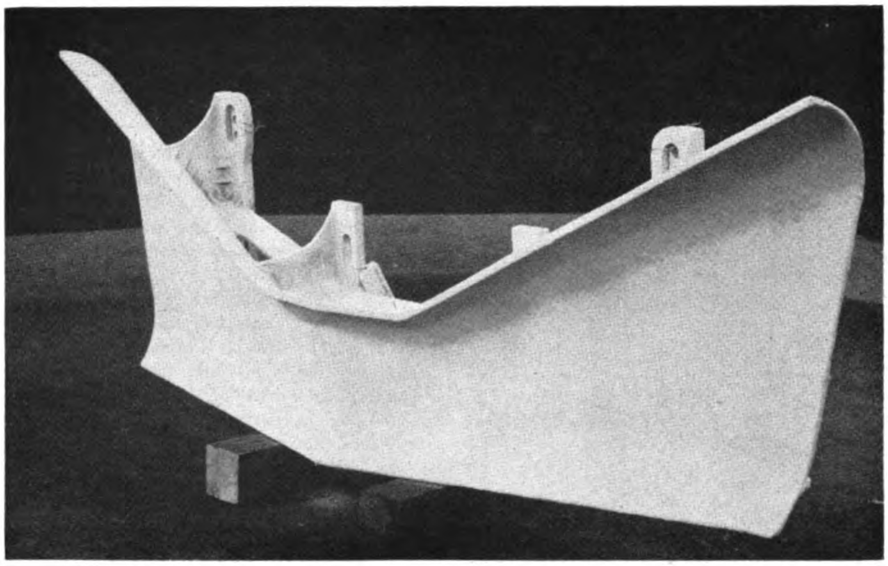
Cast Steel Pilot Snow Plow

The General Steel Castings Corporation, Granite City, Ill., has recently developed a pilot snow plow for application to diesel locomotives in either switching or road service. In use on a number of rail-

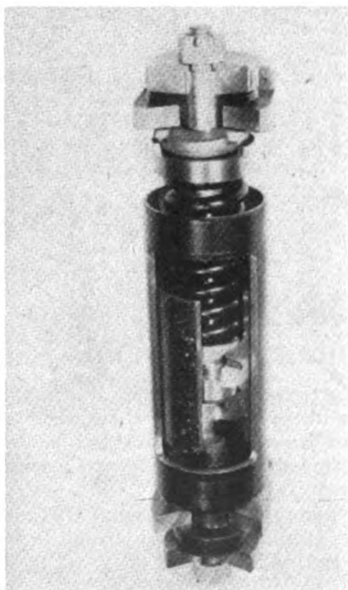


roads, these pilot plows are said to be showing good results in keeping rails clear of drifting snow and eliminating the repeated use of large snow-removing equipment.

Commonwealth pilot snow plows are rugged one-piece steel castings designed so that snow is effectively removed from the rails without causing interference with traction motors or obstructing cab steps. Provision is made for ample adjustment to the desired height above the rail. For seasonal use they may be easily applied, removed and reapplied, but, if permanently installed, they serve a year-round purpose as strong deflecting pilots which clear the way of obstructions, substantially reducing the possibility of accident or derailments. Providing economical service, these sturdy one-piece castings are designed to withstand great abuse with practically no maintenance.

The new pilot snow plow does not interfere with normal coupling operations and, when locomotive units are coupled together, there is sufficient clearance for negotiating 130-deg. curves. Pilot plows may be applied at either or both ends of the diesel, depending upon service requirements. Designs are available for almost all standard types of diesel switcher or road locomotives.

Houdaille Friction Snubber



The friction-type snubber, made by the Houdaille-Hershey Corporation, Buffalo, N. Y., and sold by the General Steel Castings Corporation, is a simplified shock absorber which controls the movement of railway truck coil springs, substantially reducing excessive damage to lading and discomfort to passengers.

As shown in the accompanying phantom view, the snubber contains three segmental shoes faced with special, long-wearing molded brake lining material, attached by the Chrysler cycle-welding process. The shoes are forced outward against the barrel under constant pressure produced by a precompressed coil spring. Just the right combination of material in the lining and barrel gives uniform frictional resistance, both at the start and during movement of the truck springs, to allow smooth control of vertical motions. The amount

of snubber friction is precalibrated to match any given spring group.

The design of the snubber mountings provides universal-joint action to accommodate any change in angularity of the snubber due to relative movements between the spring plank and bolster. Rubber compression blocks hold the double-faced rockers in continuous solid contact with the snubber mounting brackets. By this means, any vertical movement of the bolster is controlled by the friction snubbers. Shocks are dissipated before they reach the truck bolster.

phery about its entire circumference. The forged spindle is mounted on especially selected, preloaded taper roller-bearing. Anti-friction bearings are used for all rotating shafts. A clutch permits hand rotation of turn table to facilitate position. Locking a spindle to prevent rotation does no disturb table setting.

Griswold indexing tables are made by F. T. Griswold Mfg. Co., Wayne, Pa.

Direct-Fired Heaters

Self-contained, direct-fired heaters for use in engine houses, diesel repair shops, freight stations, and other railroad structures, have been designed by the Thermobloc Division of Prat-Daniel Corporation, South Norwalk, Conn.

The unit circulates heated air at working levels under automatic controls for maintaining even temperatures in building having heavy in and out traffic. The units require no complicated piping, duct work or radiator installations and are available in floor or ceiling suspended models.

Connecting the units with an oil or gas line and electric power places them in readiness to operate and tests indicate that the working area will heat up about five minutes after the units are started. Operation is entirely automatic.

◆

Non-Alkaline Cleaning Compound

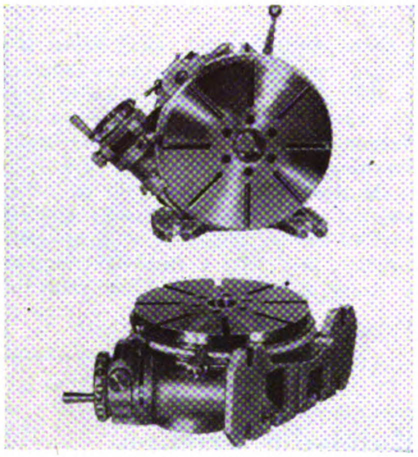
A steam cleaning compound which will improve the cleaning operation wherever steam or vapor cleaning is carried on, has been introduced by the Magnus Chemical Co., Garwood, N. J.

The solution named Magnus 72 contains no alkaline salts. It is neutral in reaction and will not dull or streak good paints. Aluminum and other soft metals which are attacked by alkaline salts are untouched by this product. It generates no objectionable fumes and can be used indoors where ordinary steam cleaners cannot be employed.

The liquid concentrate cleaner cannot clog steam cleaning equipment. It tends to protect interior unpainted surfaces against rust and corrosion due to unsaponified oil content, which works to prevent rust formation on unprotected metal surfaces.

In using Magnus 72, 2-3 qt. of the concentrate are poured into the tank of the steam cleaning machine and the tank filled with water. Where solution tank is separate, mix 2-3 qt. of the solution with 50 gal. of water.

◆



Optical Indexing Table

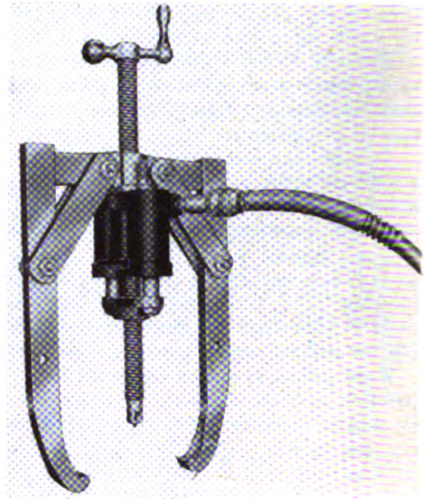
The Griswold indexing table is designed to provide greater accuracy with milling machines, jig borers and similar machines for indexing and rotary milling. The table may be used either in a vertical or horizontal position.

An engraved glass degree scale is observed directly through a compact telescope which, in conjunction with circular dial, makes possible readings accurate to .0005-in. at periphery of 12-in. circle. As the diameter of the circle decreases, accuracy increases. The reading is made at a normal viewing distance.

Effects of mechanical wear, backlash and oil film thickness are eliminated. Reproducible results can be obtained in either direction.

The turn table is supported at its peri-

◆



Power-Twin Puller

Three sizes of the Grip-O-Matic pullers developed by the Owatonna Tool Company, 410 Cedar street, Owatonna, Minn., can now be used with the company's new Power-Twin hydraulic puller. Only slight changes are necessary to change over pullers Nos. 1003L, 1003½ and 1003½-L to fast-operating hydraulic power to make them more effective and efficient and to increase their range of utility.

The Power-Twin puller speeds up the work, eliminates torque, and is safer, because of the remote control feature. The ram of the puller can easily and quickly be detached from the Grip-O-Matic puller and used just as effectively on OTC push-pullers or on a bench or pedestal press.

◆

Synthetic Rubber Packing

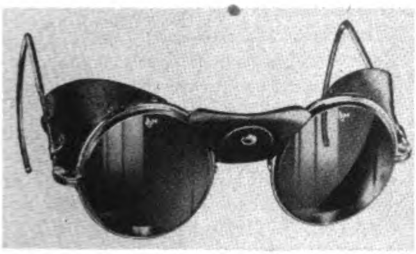
The replacement of leather packing with synthetic rubber packing in the air cylinders of air-operated control devices on new Alco-G.E. locomotives helps power contactors, reversers and dynamic braking switches operate more smoothly and more uniformly, according to engineers of General Electric and American Locomotive Company. Adapter kits for each control device have been designed for locomotives now in service.

Control devices using the new synthetic rubber packing require lubrication only once a year, while leather-packed devices are usually lubricated six times a year. The danger of faulty contacts in cold

weather due to improper lubrication is said to be eliminated by the new-type packing.

Each adapter kit consists of the materials necessary to convert one control device to synthetic packing. To insure correct identification for easy future renewal parts ordering, each kit also includes a new nameplate.

◆



Adjustable Welding Goggles

A welder's goggle, featuring removable and adjustable binder-type leather side shields has been introduced by the Americal Optical Co., Southbridge, Mass.

This goggle, series 3081A, can be adjusted for fit and comfort by loosening the endpiece screws. By removing these screws, side shields can be taken off for cleaning, sterilizing, or replacing. It replaces the series 3081 welder's goggle.

The side shields are made of soft leather to provide comfort and protection against heat, harmful light and flying particles. The cylinder bridge and reinforcing bar are also covered with leather. These side shields are also available for its No. 3080 goggle according to the manufacturer.

◆

Lubricant for High Temperatures

An anti-friction bearing lubricant—Texaco High Temp Grease—has been announced by The Texas Company, New York, which exceeds established military and industrial standards in affording unusual protection at temperatures up to 300 deg. F. for continuous operation and 350 deg. F. for intermittent operation.

During the laboratory development of Texaco High Temp Grease a variety of standard and special tests for anti-friction bearing operation revealed that the new grease has excellent oxidation resistance. It outran the hours-to-failure criteria of normal tests at 300 deg. F. and continued to exceed test specifications at even higher temperatures. An unusual characteristic of the new grease is said to be the efficiency of its performance at high speeds as revealed in special ultra-high-speed endurance tests developed at Texaco's Beacon Laboratories.

Its water resistance makes Texaco High Temp Grease applicable in operations where long retention of grease and resistance to washing out are factors.

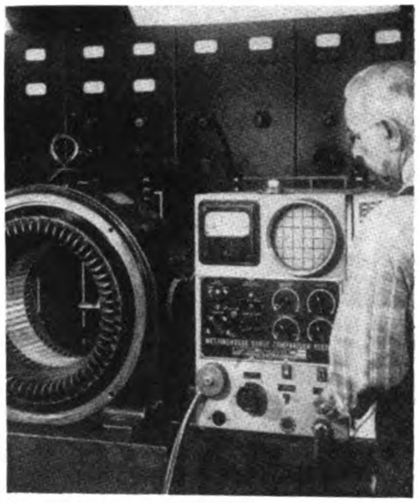
◆

Surge Comparison Tester

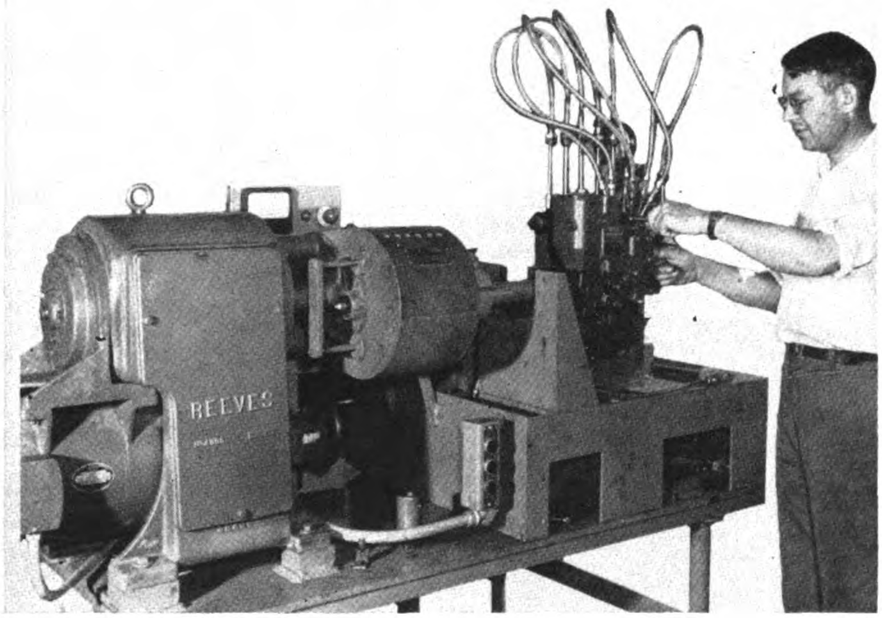
A new industrial electronic surge comparison tester is available from Westinghouse Electric Corporation. It is used to locate insulation faults and winding dissymmetries in motors, a.c. and d.c. generators, transformers and coils.

The surge comparison tester, available in either mobile or portable models, is compact and movable, and has adequate surge voltage characteristics for most insulation tests. A wide flexibility in application and simplicity of operation are designed to make the surge tester adaptable to both manufacturing and repair work.

The tester simultaneously tests turn-to-turn, phase-to-phase, and coil-to-ground insulation with potentials high enough to simulate power circuit transient stresses. With every test setup, high-frequency and high-potential qualitative tests of resistance, impedance, and turn balance are made, and the results are obtained by a single scope observation. High turn-to-turn voltages are applied without excessive winding-to-stresses. Non-destructive testing is assured even on fractional horsepower motors and generators, and destructive fault location is possible in many cases.



Portable model of surge comparison tester



Standardized Fuel Pump Testing Procedures

Research by the Cummins Engine Co., Inc., Columbus, Ind., has resulted in standardization of their diesel fuel pump testing equipment and testing apparatus.

This method developed by the study is now being utilized by Cummins dealers who maintain service locations from coast-to-coast. The need for standard testing is recognized, as hydraulic characteristics may differ between fuel pump test stands and sometimes cause variable quantities of fuel to be delivered.

Two fuel pump models, the single disc and the DD (double disc) are offered with the fuel system.

Single-plunger, low-pressure, distributor-type fuel pumps measure the fuel charge for all cylinders and assure that each injector receives the predetermined amount of fuel at any required engine speed and load within its rating.

NEWS

Keller Succeeds Jackson As Research Director

W. M. KELLER, assistant mechanical engineer, Pennsylvania, has been appointed director of mechanical research, A.A.R. Mechanical Division, succeeding J. R. Jackson who retired on December 31. Mr. Keller will have jurisdiction over all phases of research conducted by the Mechanical Division, including refrigerator car tests and studies. His headquarters will be in Chicago.

Mr. Keller was born on August 29, 1901, in Pittsburgh. He studied engineering at

W. M. Keller

the University of Pittsburgh from 1924 to 1926 and obtained the degree of M.E. at Pennsylvania State College in 1932. He entered the employ of the Pennsylvania at

J. R. Jackson

the Altoona Works in September, 1919, as an apprentice. In 1926 he became inspector, test department; in 1938, coal inspector, test department; in 1939, assistant engineer, test department; in 1941, foreman, mechanical engineer; in 1944, general foreman, car design. On November 1, 1947, he was appointed assistant mechanical engineer. Mr. Keller is a member of the Franklin Institute and the American Society of Mechanical Engineers, and has served on the Sub-Committee on Refrigerator Car Design of the Mechanical Division, A.A.R.

Mr. Jackson, who was born on May 5, 1886, in Ft. Wayne, Ind., was educated at Purdue University where he received the degree of B.S. in M.E. in 1910, and the degree of M.E. in 1915. He began his railroad career on the Pennsylvania at Ft. Wayne, serving as a machinist apprentice from 1903 until 1906 and during the summers of 1907-09. From June 1910 until 1917 he was in the test and inspection department of the Atchison, Topeka & Santa Fe where he became assistant engineer of tests. He was commissioned a captain in the U.S. Reserve in 1917 and was promoted to Major, Ordnance, U.S. Reserve, in 1919. On March 1, 1919, Mr. Jackson was appointed mechanical engineer, Division of Operation, U.S.R.A., at Washington, D.C. In 1920 he became associated

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

		Month of September		9 months ended with September	
Item No.		1951	1950	1951	1950
3	Road locomotive miles (000) (M-211):				
3–05	Total, steam	22,950	30,717	227,849	256,502
3–06	Total, Diesel-electric	23,551	18,492	198,738	152,690
3–07	Total, electric	770	859	7,309	7,386
3–04	Total, locomotive-miles	47,271	50,075	433,918	416,625
4	Car-miles (000,000) (M-211):				
4–03	Loaded, total	1,732	1,792	15,461	14,320
4–06	Empty, total	900	885	7,854	7,518
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6–01	Total in coal-burning steam locomotive trains	42,788	53,690	398,273	425,168
6–02	Total in oil-burning steam locomotive trains	11,314	14,299	108,306	113,123
6–03	Total in Diesel-electric locomotive trains	66,505	53,419	555,792	432,902
6–04	Total in electric locomotive trains	2,152	2,339	20,027	19,578
6–06	Total in all trains	122,767	123,775	1,082,516	990,984
10	Averages per train-mile (excluding light trains) (M-211):				
10–01	Locomotive-miles (principal and helper)	1.04	1.05	1.04	1.05
10–02	Loaded freight car-miles	40.60	40.10	39.60	38.40
10–03	Empty freight car-miles	21.10	19.80	20.10	20.20
10–04	Total freight car-miles (excluding caboose)	61.70	59.90	59.70	58.60
10–05	Gross ton-miles (excluding locomotive and tender)	2,880	2,769	2,771	2,659
10–06	Net ton-miles	1,364	1,296	1,299	1,211
12	Net ton-miles per loaded car-mile (M-211)	33.60	32.30	32.80	31.50
13	Car-mile ratios (M-211):				
13–03	Per cent loaded of total freight car-miles	65.80	66.90	66.30	65.60
14	Averages per train hour (M-211):				
14–01	Train miles	17.10	16.70	16.90	16.90
14–02	Gross ton-miles (excluding locomotive and tender)	48,514	45,555	46,314	44,422
14	Car-miles per freight car day (M-240):				
14–01	Serviceable	47.40	48.80	46.00	44.70
14–02	All	45.10	46.10	43.90	41.70
15	Average net ton-miles per freight car-day (000) (M-240)	111.10	112.00	111.90	110.10
17	Per cent of home cars of total freight cars on the line (M-240)	37.80	35.80	37.20	42.40

PASSENGER SERVICE (DATA FROM I. C. C. M-213)

3	Road motive-power miles (000):				
3–05	Steam	8,730	11,913	92,496	105,280
3–06	Diesel-electric	16,782	15,052	145,663	130,236
3–07	Electric	1,577	1,602	14,571	14,409
3–04	Total	27,090	28,568	252,729	249,926
4	Passenger-train car-miles (000):				
4–08	Total in all locomotive-propelled trains	270,056	279,578	2,462,736	2,408,620
4–09	Total in coal-burning steam locomotive trains	45,894	63,492	484,802	541,704
4–10	Total in oil-burning steam locomotive trains	30,437	38,481	298,249	332,448
4–11	Total in Diesel-electric locomotive trains	176,224	160,230	1,524,001	1,379,438
12	Total car-miles per train-miles	9.78	9.64	9.59	9.44

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours (000):				
1–01	Steam, coal-burning	1,053	1,457	10,949	12,689
1–02	Steam, oil-burning	221	273	2,136	2,180
1–03	Diesel-electric[1]	2,953	2,659	26,295	22,017
1–06	Total	4,250	4,419	39,610	37,129
2	Passenger yard switching hours (000):				
2–01	Steam, coal-burning	37	50	421	527
2–02	Steam, oil-burning	12	14	116	119
2–03	Diesel-electric[1]	239	234	2,172	2,037
2–06	Total	321	332	3,010	2,988
3	Hours per yard locomotive-day:				
3–01	Steam	7.30	8.70	7.80	7.90
3–02	Diesel-electric	16.90	17.90	17.20	17.40
3–05	Serviceable	14.20	14.70	14.40	14.00
3–06	All locomotives (serviceable, unserviceable and stored)	12.20	12.70	12.40	11.80
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.70	1.71	1.77	1.79
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.74	0.74	0.76	0.77

[1] Excludes B and trailing A units.

'blood pressure"

UNLESS you've made a trip in this car, you've never seen anything quite like it before.

It's Electro-Motive Division's Engineering Test Car—a veritable "rolling laboratory" equipped to obtain accurate and detailed information on all phases of locomotive performance.

Designed and built by Electro-Motive three years ago, this car has already traveled more than 150,000 miles on American railroads—checking locomotive performance in every type of terrain and under all kinds of actual working conditions.

It is equipped with scores of intricate electrical counters, temperature recorders and timing devices to gauge and record anything needed that can be measured by an electrical current.

It carries instruments capable of measuring the temperature of traction motor bearings while operating at high speed.

It measures currents in power circuits during transition.

It tells us axle stresses under rolling loads—and measures rail stresses as trains pass over.

It even tells us the locomotive's "blood pressure," if you will—checking and recording the temperature of oil and water throughout the engine.

Another of Electro-Motive's many plus services to railroads, this on-the-rail testing gives both our customers and our engineers a wealth of information that couldn't be obtained in any other way. You see the results in longer life of GM Diesel locomotive parts—in a continuous stream of improvements that lift the performance standards of General Motors locomotives to even higher levels.

GENERAL MOTORS
LOCOMOTIVES

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS
La Grange, Illinois • Home of the Diesel Locomotive
In Canada: GENERAL MOTORS DIESEL, LTD., London, Ontario

with the Lewis Engineering Company, Chicago and Toronto, as mechanical engineer, being later appointed chief engineer. He became a copartner of Pioneer Precooling Plants at Lodi and Napa, Cal., in 1923; on July 1, 1925, engineer of tests of the Missouri Pacific Lines, and on September 1, 1946, mechanical engineer of the Mechanical Division, A.A.R.

Mr. Jackson has actively served on various committees of the American Society for Testing Materials. As a member of the Mechanical Division, A.A.R., he has served on the Committee on Development of Hot Box Alarm Devices, Committee on Axle Research, Committee on Crank Pin Research, and as chairman of the Committee on Journal Bearing Development. Mr. Jackson is a member also of the Locomotive Maintenance Officers' Association; Western Railway Club; Car Department Officers' Association; the Railway Fuel and Traveling Engineers' Association, of which he was president in 1938, and the American Society of Mechanical Engineers. of the Railroad Division of which he was chairman in 1943.

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE JANUARY ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horsepower*	*Service*	*Builder*
Baltimore & Ohio	37[1]	1,500	Freight	Electro-Motive
	12[1]	1,600	Freight	Alco-G.E.
	6[1]	1,600	Freight	Baldwin-Westinghouse
Reading	12[2]	....		Alco-G.E.
	8[2]	....		Electro-Motive
	4[2]	....		Baldwin-Westinghouse
Transportation Corps	14[3]	44-ton		General Electric
	3[3]	25-ton		General Electric
	24[3]	80-ton		General Electric

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Denver & Rio Grande Western	500[4]	70-ton gondola	General American
Quebec, North Shore & Labrador	15	Caboose	Canadian Car & Fdry.
Toronto, Hamilton & Buffalo	100[5]	70-ton gondola	National Steel Car

[1] To be leased from the Equitable Life Assurance Society. To be delivered between April and September.

[2] To cost $3,910,000. Most of the units will be used in road freight-switching service, with a few designed for passenger service. Deliveries expected to be completed in 1952.

[3] Eleven of the 14 44-ton units of 0-4-4-0, dual engine type, are for use by the Air Forces and three for the Navy. Two of the 14, for which the bid price was $63,100 each, will be delivered in March and the remaining 12 at the rate of two per week, beginning the last week of October. One of the three 25-ton locomotives, for use by the Air Forces, is scheduled for April delivery; the remaining two, for June. The bid price on each of these was $19,835. Fifteen of the 24 80-ton 0-4-4-0 dual engine type locomotives, are for the Navy and nine for the Air Forces. Delivery will be at the rate of two per week, starting in nine months. The total contract value of these locomotives is $1,893,480.

[4] For delivery during fourth quarter of 1952.

[5] For 1953 delivery.

NOTES:

Erie.—The Erie's board of directors has authorized purchase of 42 diesel-electric locomotive units costing $6,000,000. Also authorized are additional diesel servicing facilities to cost $1,500,000. The motive power will include 30 1,500- and 1,600-hp. road-switching units and 12 1,000- or 1,200-hp. switching units. Maintenance facilities will be constructed at Brier Hill, Ohio, Kent and Meadville, and present facilities at the Cleveland diesel shop will be extended. "This purchase will be our last big bite toward complete dieselization," Paul W. Johnston, Erie president, said. "It will eliminate all steam service except for short-haul commuter service in the New Jersey area, which is now 60 per cent diesel equipped.

SUMMARY OF MONTHLY HOT BOX REPORTS

Month	Foreign and system freight car mileage (total)	Cars set off between division terminals account hot boxes			Miles per hot box car set off between division terminals
		System	Foreign	Total	
July, 1950	2,745,932,894	....	.....	23,957	114,619
August, 1950	2,937,455,020	7,422	15,490	22,912	128,206
September, 1950	2,974,297,739	6,541	12,881	19,422	153,141
October, 1950	3,165,997,915	4,343	8,935	13,278	238,439
November, 1950	2,868,871,913	2,536	5,331	7,867	364,672
December, 1950	2,813,042,212	2,278	5,968	8,246	341,140
January, 1951	2,840,847,511	2,870	8,436	11,306	251,269
February, 1951	2,425,226,454	4,528	14,063	18,591	130,452
March, 1951	3,063,173,942	3,667	10,078	13,745	222,857
April, 1951	2,996,562,763	3,702	8,914	12,616	237,521
May, 1951	3,013,634,782	5,631	13,737	19,368	155,599
June, 1951	2,874,873,495	7,074	15,376	22,450	128,057
July, 1951	2,768,920,095	8,886	18,823	27,709	99,929
August, 1951	3,009,371,111	9,023	19,092	28,115	107,038
September, 1951	2,925,570,545	6,472	13,565	20,037	146,008

P.R.R. Tries Two New Locomotive Designs

FOUR new electric freight locomotives, with many modern developments to provide more efficient and better service, have been built for the Pennslyvania by General Electric and Westinghouse, working in collaboration with railroad engineers.

Three locomotives are already in fast freight service in the road's electrified territory and the fourth is under tests. They represent a total cost of about $3,000,000 and each consists of two identical streamlined units similar in appearance to diesels.

Two locomotives, built by Westinghouse, employ the first application to locomotives of the ignition rectifier, an electronic principle using large mercury arc tubes to convert the 11,000-volt, 25-cycle, a.c. power from the contact system to direct current for the motors. The railroad and the electric company cooperated in adapting it successfully to an electric suburban car after its initial development for industrial usage, and then further refined it for use on locomotives, improving and simplifying the method of power conservation. Rated at 6,000 hp. continuously, each locomotive is 124-ft. long, has 44-in. driving wheels, and weighs about 755,000 lb.

The other two locomotives built by General Electric, which are described elsewhere in this issue, develop 5,000 hp. each continuously and up to 10,000 hp. during acceleration or when ascending grades. Work on their design began in 1937 but was interrupted by World War II. The parts have been built as simple as possible, and adequate space has been provided within the locomotive to facilitate inspection and maintenance. Each is 108½ ft. long, has 48-in. driving wheels, weight 491,000 lb. and will multiple with many existing electric freight units.

The locomotives have traction motors driving all wheels, similar to modern freight diesels. The full weight of the locomotives is thus utilized to produce maximum tractive force. They are equipped with dynamic braking, in addition to air brakes.

On the Track of Cheaper Diesel Fuel

THE Denver & Rio Grande Western—which pioneered in the use of spectrographic analysis of diesel lubricating oils, not only on quality control but for control of wear rates and mechanical performance of locomotives—is now adding analysis by electronic microscope to its techniques. Such analysis in cooperation with oil producers having shown promise, the railroad has now purchased its own electronic microscope equipment for installation in its laboratory at Denver.

The railroad, according to Ray McBrian, engineer of standards and research, expects to use this microscope in the study of diesel fuels as well as in further research on lubricants. This inquiry, augmented by the research work on ignition improver, pour-point depressants and other similar studies, will be directed to the development, if possible, of a satisfactory diesel fuel based on low cost residual oils of high B.t.u. content.

In cooperation with engine builders and oil refiners the railroad hopes to prove the availability of lower priced fuel. Since a price reduction of only half a cent per gallon would save the railroad $150,000 annually, the potential reward is considered highly attractive in ratio to the relatively slight outlay required.

Mechanical Division Circular Letters

Four circular letters were issued by the A.A.R. Mechanical Division on January 7 relating to more or less important details of mechanical department work.

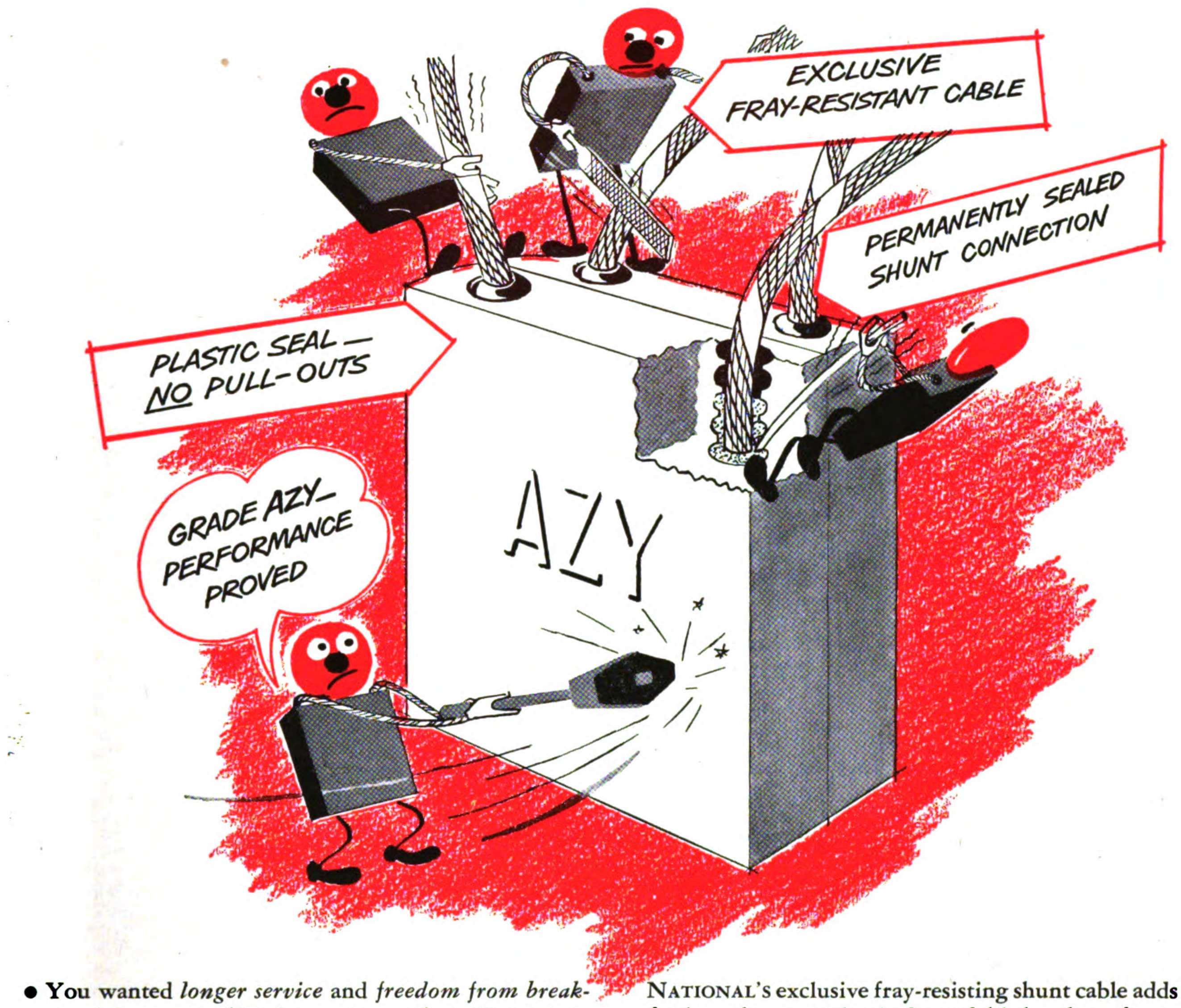
The first letter File No. L-44 (c-709) related to the use of reclaimed waste from diesel engine lubricating filters for journal box packing and recommended strongly against the use of this waste unless it fully meets the requirements of Specification EM-910-50.

The second letter File No. ST-1-101

YOU ASKED FOR IT!

NATIONAL CARBON *HAS IT!*

...THE BEST D-E TRACTION MOTOR BRUSH MONEY CAN BUY!



• You wanted *longer service* and *freedom from breakage,* with no sacrifice in *commutation.* NATIONAL CARBON gave you AZY—the only grade having all three.

You wanted *an end to shunt connection pull-outs.* NATIONAL's new, Permanently-Sealed Connection withstands all conditions. Of the millions already in service, not one connection failure has been reported.

You demanded *relief from cable fraying.* HERE IT IS! NATIONAL's exclusive fray-resisting shunt cable adds the final touch to completely dependable brush performance on D-E Traction Motors.

Don't forget, too, that these STANDARDIZED brushes are manufactured for stock—answer your requirements of uniformity and immediate availability. You get *better brushes . . .* at a *better price . . .* in a *better package.*

ADD THEM UP. THEY TOTAL THE FINEST BRUSH MONEY CAN BUY.

BUY NATIONAL STANDARDIZED BRUSHES FOR MOST EFFICIENT MOTOR AND GENERATOR OPERATION.

The term "National" and the Silver Strand Cable device are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, New York

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco.
In Canada: National Carbon Limited, Montreal, Toronto, Winnipeg.

(c-706) referred to the maximum permissible throw of ⅜ in. at axle center after rough turning of journals and wheel seats and insists that this requirement be met for the axles of all cars to be acceptable in interchange. It requests that the secretary's office be advised of all instances in which axle manufacturers refuse to accept orders for axles without some waiver or modification of this A.A.R. requirement.

A third letter File No. PC-2246 (c-711) specified price increases for car repair labor under interchange rules varying from 6 per cent for some air brake repairs to 21 per cent for labor per hour and 27 per cent or more for repacking journal boxes dependent upon journal size.

The fourth letter File No. L-95 (c-707) related to the quality and condition of journal bearings received from manufacturers and showed in one check of 5,000 bearings a rejection of 278 or 5.56 per cent due to a number of mechanical defects, the most numerous of which were pin holes in linings, dirty castings, tapered bores and shrinkage. This letter recommended the exercise of exceptional care in acceptance of journal bearings from foundries to assure satisfactory performance and the avoidance of hot box difficulties.

Combined Electrical Sections Appoint Secretary

S. W. MARRAS, junior engineering aid, Electrical Department, Illinois Central, has been appointed secretary of the recently combined Electrical Sections of the A.A.R. Engineering and Mechanical Divisions. Mr. Marras' headquarters will be in Chicago.

SUPPLY TRADE NOTES

TIMKEN ROLLER BEARING COMPANY—*Sherman R. Lyle* of the Cleveland office of Timken has been appointed district manager of the steel and tube division, northern Pennsylvania and New York state district. Mr. Lyle has been with Timken as sales engineer for the Cleveland district since 1946. His new office will be in Buffalo.

◆

HOUDAILLE-HERSHEY CORPORATION.—The *General Steel Castings Corporation*, Granite City, Ill., has been appointed sales representative for the Houdaille friction snubber on all applications of the snubber to railroad car trucks of G.S.C. manufacture. This snubber, designed by the *Chrysler Corporation*, is manufactured by the Houdaille-Hershey Corporation.

◆

ELASTIC-STOP NUT CORPORATION, AMERICAN GAS ACCUMULATOR COMPANY.—Stockholders of the Elastic Stop Nut Corporation of America and the American Gas Accumulator Company are holding special meetings this month to vote upon a proposed merger of the two companies. After the merger of A.G.A. into Elastic, the former's business would be carried on as a division of Elastic under present A.G.A. management.

◆

BABCOCK & WILCOX CO.—The Babcock & Wilcox Tube Co. has transferred its assets and business to the Babcock & Wilcox Co., its sole stockholder. The business continues to be operated as the tubular products division of Babcock & Wilcox.

◆

AMERICAN STEEL & WIRE CO.—*Fred L. Nonnenmacher* has been named manager of Chicago district sales of the *American Steel & Wire Co.*, subsidiary of U.S. Steel, succeeding *E. A. Murray*, resigned. Taking Mr. Nonnenmacher's place as manager of the manufacturers' products sales department in Chicago is *S. W. Goodenough*, while *R. H. Hauger* succeeds Mr. Goodenough as assistant mnager of mnufacturers' product sales, in Chicago.

◆

WHITING CORPORATION—*L. D. Reed*, executive engineer of the Whiting Corporation, Chicago, retired from active duty on November 30.

DEARBORN CHEMICAL COMPANY.—*Dr. Henry C. Rosenberg* has joined the research staff of the Dearborn Chemical Company, Toronto.

◆

JOSEPH T. RYERSON & SONS, INC.—Joseph T. Ryerson & Sons, Inc., has acquired the stocks and warehouse facilities formerly owned by the *Seattle Steel Company* and the *Inland Empire Steel Company*. Seattle Steel and Inland Empire Steel are in process of dissolution.

◆

AIR REDUCTION COMPANY.—*Joseph H. Humberstone* has been elected a vice-president of the Air Reduction Company. *Scott D. Baumer* succeeds Mr. Humberstone as president of the Airco Equipment Manufacturing division.

◆

JOHN A. ROEBLING'S SONS COMPANY. *Donald C. Hansen* has been named district sales representative for Ohio, Michigan and Western New York State, Woven Wire Fabrics Division.

◆

PENNSYLVANIA SALT MANUFACTURING COMPANY OF WASHINGTON—*Richard A. Snyder* has been appointed district sales manager for the Pennsylvania Salt Manufacturing Company of Washington. Mr. Snyder assumes the position of district sales manager of the industrial cleaners division and will head the Los Angeles sales office in the Westland Warehouse building. He was previously technical sales and service representative in Berkley, Cal.

◆

QUAKER RUBBER CORPORATION.—*J. R. Lewis*, assistant general sales manager, has been appointed general sales manager of the Quaker Rubber Corporation, Division of H. K. Porter Company, Philadelphia, succeeding *H. M. Sossaman* who has been elected vice-president in charge of commercial development.

◆

PITTSBURGH STEEL FOUNDRY CORPORATION—*Roy J. Heinz* has been elected vice-president of the Pittsburgh Steel Foundry Corporation in charge of operations at its Glassport, Pa., foundry. Mr. Heinz has been general foundry superintendent at Glassport for the past six years.

E. I. DU PONT DE NEMOURS & CO.—*Granville M. Fisher*, formerly transportation sales representative for the finishes division of E. I. du Pont de Nemours & Co. in the New York area, has been promoted to a supervisory position in the division's trade sales section. *J. David Lee*, formerly with the Philadelphia regional office, succeeds Mr. Fisher, with headquarters in New York.

◆

WESTINGHOUSE ELECTRIC CORPORATION—*H. H. Hanft* has been appointed assistant to the manager of the industrial department for the Westinghouse Electric Corporation. Mr. Hanft had been manager of the land transportation section.

◆

K. W. BATTERY COMPANY.—The K. W. Battery Company has announced completion and occupancy of a new $500,000 manufacturing plant, research laboratory and executive offices at 3555 Howard street, Skokie, Ill.

◆

PRESSED STEEL CAR COMPANY.—*William W. Greenway* has been appointed general manager of the Chicago steel tank division of Pressed Steel Car Company, with headquarters in Chicago. Mr. Greenway was formerly manager of the company's Rice & Adams equipment division in Buffalo, N. Y.

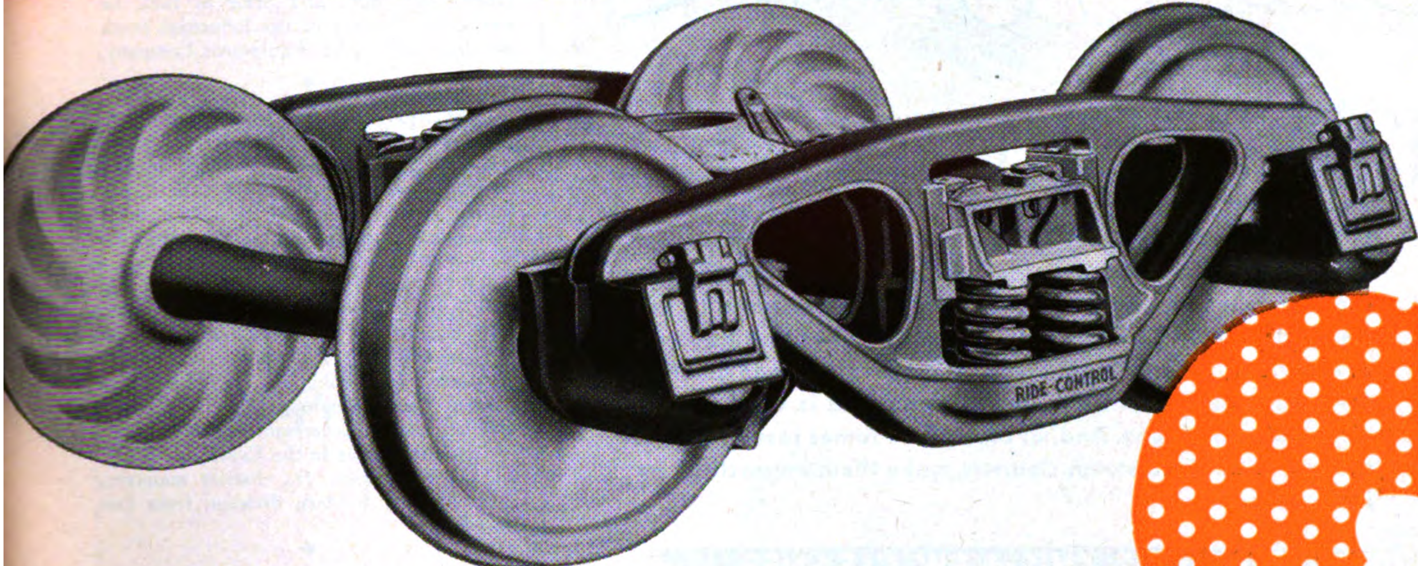
◆

FARREL-BIRMINGHAM COMPANY. — The Farrel-Birmingham Company, Ansonia, Conn., has acquired the common stock of the *Consolidated Machine Tool Corporation*, Rochester, N. Y., part of the consideration being Farrel-Birmingham securities. The Consolidated plant will be operated as a subsidiary of Farrel-Birmingham and will continue production of its machine tool lines. *Arthur H. Ingle* will remain as president of Consolidated and will be a director of Farrell-Birmingham.

◆

GENERAL ELECTRIC COMPANY—*W. J. Walker*, a member of the sales manager's staff of the locomotive and car equipment department of the General Electric Company, at Erie, Pa., has retired after 45 years of service with the company. Mr. Walker joined G.E.'s test program in 1906 and the

DESIGNED...DEVELOPED and PROVED by American Steel Foundries



With pardonable pride we remind railroaders that ASF was responsible for the development of the Ride-Control freight car truck. Its achievements in the field have been very gratifying during these last eight years.

Today, almost 300,000 ASF Ride-Control Trucks are in operation with 174 railroads and car owners. These trucks are delivering smoother, load-protecting,road-protecting rides in a wide variety of regular and high-speed freight train and box-express services. What are the reasons for such acceptance?

The Ride-Control Truck brought to railroading two great, necessary improvements: 1) It allowed the use of long-travel springs that give soft, impact-absorbing protection to lading. Even when a car is carrying its maximum permissible rail load, there is enough *reserve* spring travel to meet the needs of modern high-speed operation. 2) It provided proper and *constant* spring-action control to prevent harmful oscillation.

Engineeringwise, greatest of all accomplishments is the *utter simplicity* of the four little friction shoes which provide that control!

If you would like to know just how the Ride-Control Truck functions, please write for our booklet, "Quick Facts II." It's yours for the asking!

AMERICAN STEEL FOUNDRIES

410 N. Michigan Avenue, Chicago 11, Illinois

Mint Mark of ○ *Fine Products*

Canadian Sales: International Equipment Co., Ltd., Montreal 1, Quebec

Ride-Control Trucks

transportation division in 1912. In January 1924, he transferred to the railway supply and renewal parts division and in 1931 became appointed manager of that division. He was appointed to the sales manager's staff in October 1947.

◆

YALE & TOWNE MANUFACTURING CO.—*James H. W. Conklin* has been appointed general sales manager of the Philadelphia division of the Yale & Towne Manufacturing Co. to succeed *James P. Kinney*, who is taking over the company's distributorship in Los Angeles and southern California.

Immediately before his present appointment, Mr. Conklin was with the sales department of the Pangborn Corporation, Hagerstown, Md., and prior to that, he was sales manager of the industrial truck division of the Clark Equipment Company.

◆

LUNKENHEIMER COMPANY.—Under a general reorganization of sales territories and executive appointments announced by the Lunkenheimer Company, Cincinnati, the United States will be divided into three Lunkenheimer sales areas—an Eastern division, under *Melvin W. Pauly*, sales manager; Central division, headed by *Harold H. Layritz*, sales manager; and Western division, directed by *Charles W. Burrage*, sales manager. *R. J. Sardieck*, with headquarters in Philadelphia, has been appointed district manager in the Eastern division; *E. R. Tieberman*, in Dallas, Tex., is district manager in the Central division; and *C. B. Rosser, Jr.*, district manager, will head the Western division, from Los Angeles.

◆

FLEXROCK COMPANY.—The mechanical rod packing and building maintenance divisions of the Flexrock Company have announced appointment of *Hinds & Associates, Inc.*, of Kansas City as their exclusive representative in Kansas, Nebraska, Oklahoma, Arkansas and western Missouri.

◆

BAKER-RAULANG COMPANY.—*G. B. Davis*, formerly sales manager of the Baker-Raulang Company, has been elected vice-president in charge of sales, to replace *John R. Morrill*, recently resigned.

◆

GRAYBAR ELECTRIC COMPANY.—*S. M. Lawrason* has been apointed manager of the Baton Rouge, La., branch of the Graybar Electric Company. Mr. Lawrason formerly was sales manager of the branch, which was opened early in 1951.

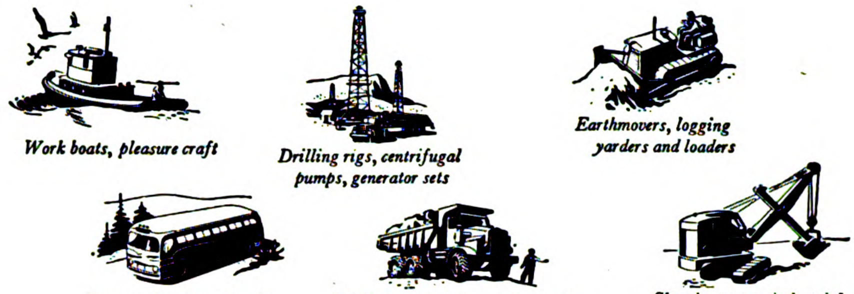
◆

GOULD-NATIONAL BATTERIES, INC.—*Willard C. Shull* has been appointed special special assistant to the president. Mr. Shull joined Gould-National in 1937 and for the past two years has been assistant general sales manager, brand sales.

◆

GENERAL STEEL CASTINGS CORPORATION.—*Pierre O. Wood* has been appointed manager of service at Granite City, Ill., succeeding *W. J. Taylor*, retired. A bio-

they're
custom-built
to fit the job!

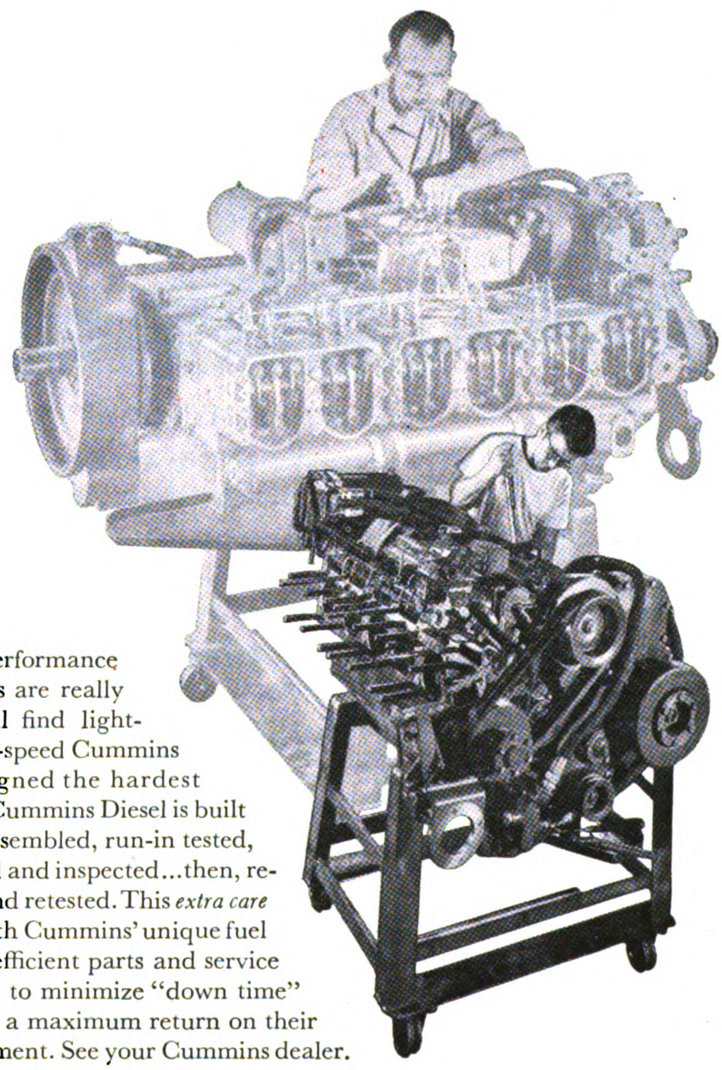


Work boats, pleasure craft
Drilling rigs, centrifugal pumps, generator sets
Earthmovers, logging yarders and loaders
Buses and highway trucks
Off-highway trucks, crawler tractors
Shovels, cranes, industrial locomotives and switchers

Lightweight, high-speed Diesels (50-550 hp) for these and many other uses

Cummins® Diesels
do so many jobs so much better

they're
BUILT NOT ONCE BUT TWICE



Wherever performance requirements are really rough, you'll find lightweight, high-speed Cummins Diesels assigned the hardest jobs. Every Cummins Diesel is built *TWICE*—assembled, run-in tested, disassembled and inspected...then, re-assembled and retested. This *extra care* combines with Cummins' unique fuel system and efficient parts and service organization to minimize "down time" ...give users a maximum return on their diesel investment. See your Cummins dealer.

CUMMINS Dependable DIESEL
TRADEMARK REG. U.S. PAT. OFF.

Diesel power by CUMMINS

CUMMINS ENGINE COMPANY, INC., COLUMBUS, INDIANA
Export: Cummins Diesel Export Corporation • Columbus, Indiana, U.S.A. • Cable: Cumdiex

graphical sketch and photograph of Mr. Wood appeared in the May 1951 issue page 102, at the time he became assistant manager of service.

◆

AMERICAN CAR & FOUNDRY CO.— *Norman E. Carlson,* has been appointed assistant chief mechanical engineer of the American Car & Foundry Co., with headquarters in New York. Mr. Carlson became associated with the company after eight years service

N. E. Carlson

with the Great Northern. He served in automotive engineering work with Swift & Co. in South St. Paul and Chicago from 1933 to 1939, when he became operations manager of Greyvan Lines in Chicago. In 1943 he became assistant master carbuilder in the mechanical department of the G.N.

◆

TAYLOR FIBRE COMPANY.—*Harold C. Steadman,* general manager of the Taylor Fibre Company, has been elected vice-president.

◆

STANDARD RAILWAY EQUIPMENT MANUFACTURING COMPANY. — *Dean C. Webster* has been appointed assistant vice-president, with headquarters in New York. Mr. Webster, who has been assistant chief en-

D. C. Webster

gineer since he joined Standard Railway in 1946, will have responsibility in Eastern and Southeastern districts for all mechanical and engineering matters dealing with Standard and its customers and per-

form other duties assigned by the vice-president in charge of sales.

◆

WILLIAM F. CLAPP LABORATORIES, INC.—*A. P. Richards* has been elected president and director of the William F. Clapp Laboratories, Inc., Duxbury, Mass., to succeed *Dr. William F. Clapp*, deceased.

◆

FENWALL, INC.—*Joseph P. Maguire* has been appointed sales representative of Fenwal, Inc. for Louisiana. Mr. Maguire's offices are at 208-209 Vincent building, 615 Commercial place, New Orleans.

◆

BUFFALO FORGE COMPANY.—*Theodore M. Dillaway* and *George B. Kellogg* have been appointed assistant vice-presidents of the Buffalo Forge Company.

Obituary

HOWARD MULL, vice-president of sales at Chicago of the Warren Tool Corporation, Warren, Ohio, died on December 22.

HARRY M. PFLAGER, director and former senior vice-president of General Steel Castings Corporation, died recently at St. Louis.

WILLIAM A. IRVIN, former president of the United States Steel Corporation, died in New York on January 1, at the age of 78. Mr. Irvin was a director and a member of the finance committee of United States Steel.

HENRY NOTT RANSOM, vice-president of the Waugh Equipment Company, died on December 26, 1951, in St. Clare's Hospital, New York. Mr. Ransom was born in Gordonville, N. Y., on August 19, 1870, and was educated at the Albany Boys Academy. At various times in his career, Mr. Ransom was connected with the sales departments of the Consolidated Car Heating Company, the Christinson Air Brake Company, the General Electric Company and the Westinghouse Electric & Manufacturing Co., and was purchasing agent for the International Railway. He was with Waugh Equipment for more than 30 years.

DR. WILLIAM F. CLAPP, president and director of the William F. Clapp Laboratories, Inc., Duxbury, Mass., died on December 28.

HERBERT I. DUNPHY, assistant vice-president of the American Car & Foundry Co., died on January 23 after a brief illness.

PERSONAL MENTION

General

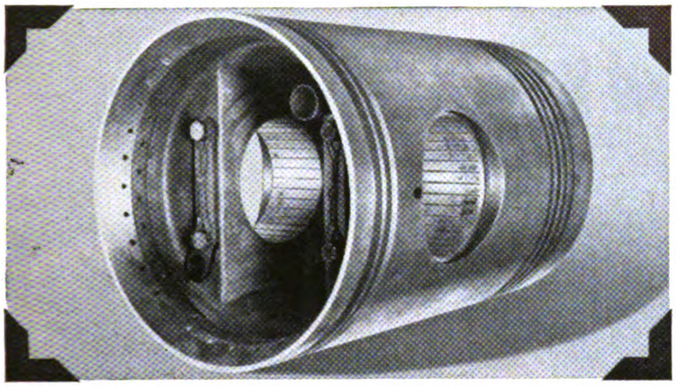
William H. Gimson, superintendent of motive power of the St. Louis-San Francisco at Springfield, Mo., has been appointed chief mechanical officer at Springfield. Mr. Gimson, who was born on September 13, 1887, at Memphis, Tenn.,

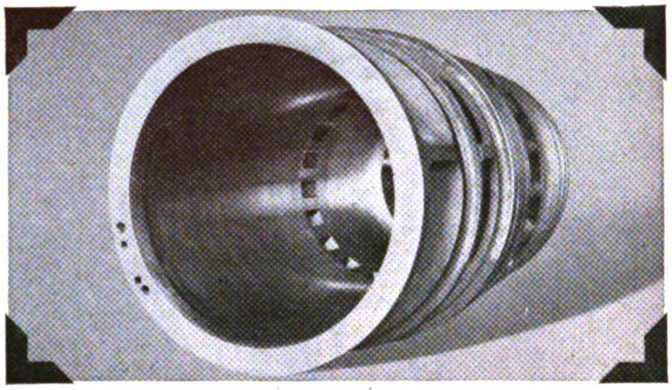
STANDARD ENGINEER'S REPORT

DATA

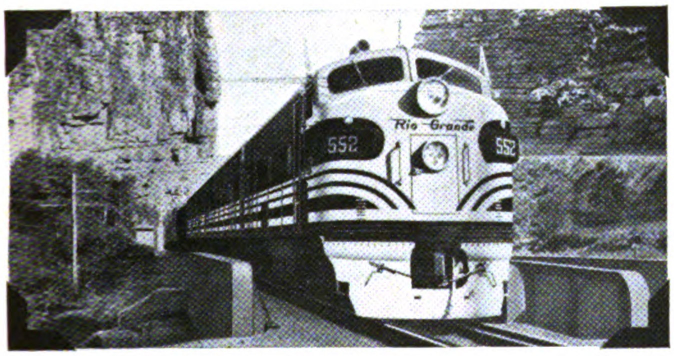
LUBRICANT	RPM Delo Oil R.R.
UNIT	Diesel Locomotive cylinder assembly
SERVICE	Mountain Freight
LOCATION	Transcontinental freight service on Moffat tunnel + Royal Gorge Routes
PERIOD	In excess of 8 years
FIRM	Denver & Rio Grande Western R.R.Co.

One million miles of service on cylinder liners and pistons





IN SERVICE APPROXIMATELY 1,000,000 MILES in Denver & Rio Grande Western Railroad diesel locomotive engines, this piston and cylinder liner were always lubricated with RPM DELO Oil R.R. At the end of that time wear measurements (inches) were only: Piston Skirt—0.001; Ring Grooves—No. 1—0.003 to 0.006, No. 2—0.002, No. 3 & 4—none; Cylinder liner (maximum diameter)—0.0095, (out of round)—0.002 to 0.004.

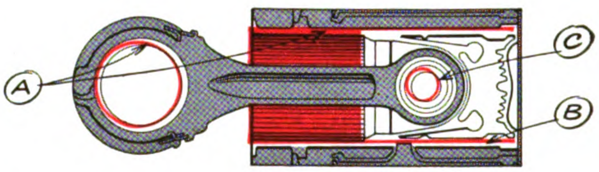


RPM DELO Oil R.R. has been the standard on the Denver & Rio Grande Western Railroad for over-the-road freight and passenger locomotives since their first power of this type was placed in service in January 1942. At the time this inspection was made approximately 49,563,104 miles had been traversed by the Rio Grande freight diesel fleet of 100 units and during that period only 77 cylinder liners had been scrapped for any reason. At that time many of the original pistons and cylinder liners were still in service and the average age of all these assemblies, including recently purchased power, was 4.7 years.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM" REG. U.S. PAT. OFF.

How RPM DELO Oil R. R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushings or bearing metals and foaming in crankcase.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver I, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

became a machinist apprentice on the Frisco at Memphis in September 1904. He was later enginehouse foreman and on

W. H. Gimson

March 1, 1917, became division foreman at Harvard, Ark. He subsequently served at Monett, Mo., as general foreman and on August 15, 1929, was appointed shop superintendent at Tulsa, Okla. He became master mechanic at Tulsa on January 1, 1941; assistant superintendent motive power at Springfield in October 1945, and superintendent motive power in May 1947.

W. B. Berry, chief mechanical officer of the St. Louis-San Francisco, at Springfield, Mo., has retired. Mr. Berry was born on December 13, 1881, at St. Louis. He attended Austin College at Sherman, Tex., and served in the Spanish-American War before starting his railroad career in 1899 as a machinist-apprentice with the Texas & Pacific. Subsequently as a machinist he worked for a number of railroads, joining

W. B. Berry

the Frisco in 1907 at Sherman, Tex. After serving as enginehouse foreman at Monett, Mo., and Ft. Worth, Tex., Mr. Berry became enginehouse and general foreman at Springfield in 1919. In 1922 he was transferred to Kansas City as master mechanic. In 1935 he was appointed assistant superintendent of motive power at Springfield; in 1945 superintendent of motive power, and in 1948 chief mechanical officer.

Harrison L. Price, superintendent of shops of the Atchinson, Topeka & Santa Fe

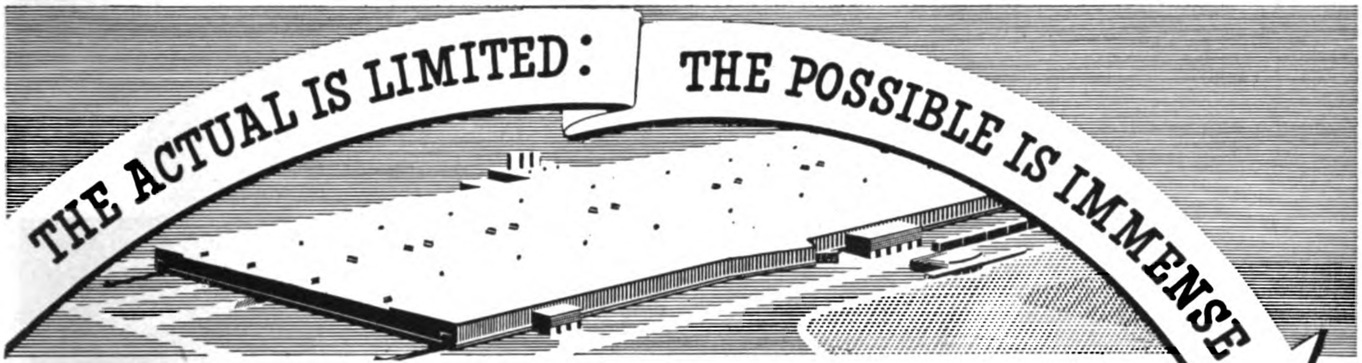
at Albuquerque, N. M., has been appointed mechanical assistant, with headquarters in Chicago. Mr. Price entered Santa Fe service as a machinist apprentice at Topeka, Kan., in 1916. He worked successively as clerk, machinist, engine inspector, apprentice instructor, welder, test department assistant, car gang foreman, airbrake foreman, and acting superintendent of Chicago car works until 1941 when he was appointed superintendent Chicago car works. He was appointed master mechanic at Chanute, Kan., in 1943, and in April of that year transferred to Chicago. In 1949 he became superintendent of shops at Albuquerque.

H. L. Price

Ralph D. Bryan, mechanical assistant of the Atchison, Topeka & Santa Fe at Chicago, has retired. Mr. Bryan entered Santa Fe service in 1905 at Argentine, Kan. He served as a laborer, appointed car clerk, bonus clerk and assistant car foreman until 1915 when he became general car foreman at Arkansas City, Kan. He later served in various other positions until 1937 when he was appointed assistant superintendent of the car department at San Bernardino, Cal. In 1939 he was transferred to Topeka as acting engineer of car construction. Mr. Bryan was appointed engineer car construction at Topeka in 1942 and later in that year became mechanical assistant.

R. D. Bryan

(*Continued on page 128*)



NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

SPEEDS CONSTRUCTION . . . CUTS MAINTENANCE COSTS

WELDING speeds, *up to 300% faster than with hand welding*, are being achieved with Automatic and Manual "Lincolnwelding". At the same time, deeper penetration and greatly simplified welding procedures are assuring top quality welds conforming to A.A.R. standards with a minimum of supervision. The net results are more work with fewer man-hours and less cost. On conventional maintenance, hand welding with Lincoln's "Shield-Arc," "Fleetweld" team is speeding repair work with faster, easier welding in all positions, according to reports.

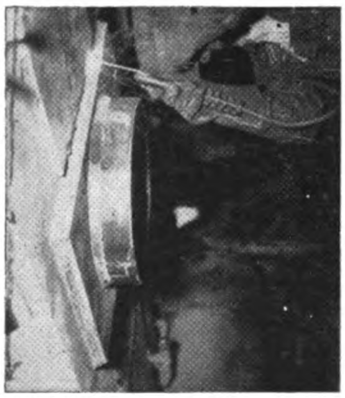


Fig. 3 Replaces Center Plate *on diesel locomotive. Old plate is cut out, ring is fillet welded to new plate, in flat position. Ring assembly is then fitted overhead to frame, and fillet welded with "Fleetweld" 5.*

Fig. 4 Reclaims Center Plate Castings *by building up surfaces with Lincoln "Fleetweld" 5.*

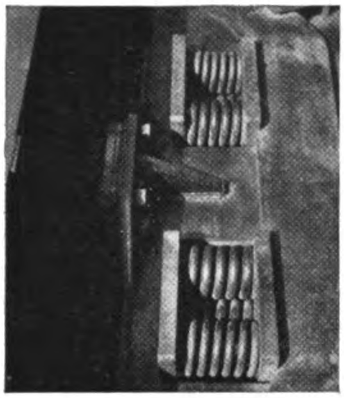


Fig. 5 Fabricated Trucks *for diesel locomotive. Components are flame cut from steel plate and fillet welded into a single, rugged assembly.*

ARC WELDING SAVES MAN-HOURS AND CUTS COSTS ...ALL WAYS

Fig. 1 "Manual Lincolnwelding" *center sill reinforcement. Welding speed is 20 inches per minute.*

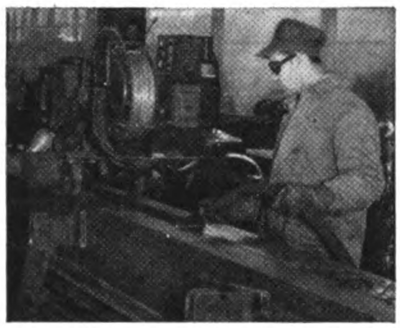


Fig. 2 "Automatic Lincolnwelding" *of center sill Z-bars in the production of freight cars. Welding speed is 40 inches per minute.*

HERE'S MORE PROOF

For further information about arc welding procedures and equipment, write The Lincoln Electric Railway Sales Co., 11 Public Square, Cleveland 13, Ohio. Railroad representatives of

THE LINCOLN ELECTRIC COMPANY

CLEVELAND 17, OHIO

(*Continued from page 124*)

ARTHUR SELBEE, superintendent of motive power and car equipment of the Central Vermont at St. Albans, Vt., has been appointed general superintendent of motive power and car equipment of the Grand Trunk Western, with headquarters at Battle Creek, Mich.

W. C. SEALY, who has retired as general superintendent motive power and car equipment, Central Region, of the Canadian National at Toronto, as announced in the January issue became a messenger in the shops of the C.N.R. at Stratford, Ont., in May 1903. In 1904 he became an apprentice mechanic and in 1909, erecting shop foreman at Stratford. Between 1910 and 1915 he was, successively, general foreman and assistant master mechanic at Toronto. In the latter year he was appointed master mechanic and served until 1917 when he was loaned to the General Car & Machinery Co., Montmagny, Que., as an instructor in the installation of a shell manufacturing plant. He returned to the C.N.R. in the same year as a foreman in the Stratford shop which was then engaged in the manufacture of shells for the British army. Mr. Sealy was appointed general foreman at Stratford in 1921, and from October 1928 to January 1929 was acting superintendent motive power. He then became superintendent motive power. He was named general superintendent motive power and car equipment at Toronto in October 1942.

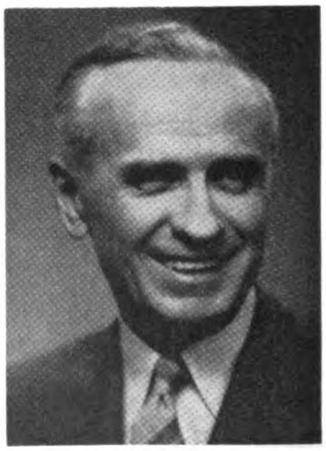
E. F. TUCK, assistant superintendent of motive power of the St. Louis-San Francisco at Springfield, Mo., has been appointed superintendent of motive power at Spring-

E. F. Tuck

field. A sketch and photograph of Mr. Tuck appeared on page 154 of the November, 1951, issue at the time of his appointment to the position of assistant superintendent of motive power.

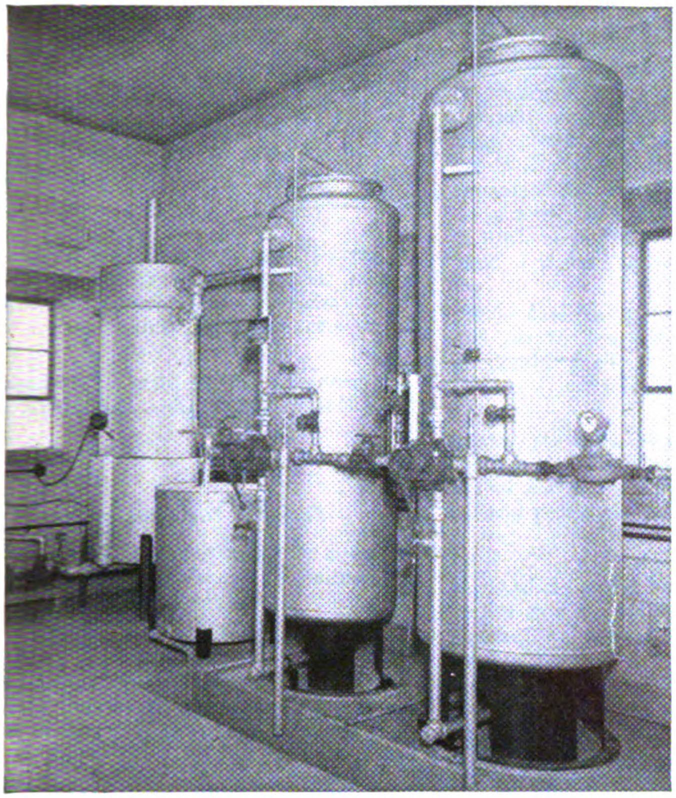
Car Department

C. A. GAMMON, general car foreman of the Miller shops of the Florida East Coast at St. Augustine, Fla., has been appointed to the newly created position of superintendent car department. The position of master car builder has been abolished.



C. A. Gammon

Mr. Gammon was born at Cedar Rapids, Iowa, on January 26, 1896, and entered railroad service with the New York, Chicago & St. Louis at Stony Island shops, Chicago, as stock clerk in the stores department. He later transferred to the mechanical department as wheel checker, air brake apprentice and A.A.R. checker. He was with the Illinois Central in the A.A.R. billing department at Chicago until No-

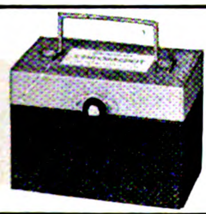


A DEARBORN DE-IONIZING SYSTEM TO MEET THE COMPLETE NEEDS OF YOUR RAILROAD

A Dearborn De-Ionizing system will provide the mineral-free water you need at less than 10 percent the cost of distilled water.

This mineral-free water, when conditioned with Dearborn formula 517, will provide proper Diesel cooling . . . eliminate mechanical failure of liners, heads and blocks caused by corrosion, scale and sludge deposits. This combination will protect cooling systems of engine-driven auxiliary generators and radiators of trucks, buses, scrapers, graders, caterpillars. Dearborn De-Ionizing systems will also produce mineral-free water for storage batteries and adequate supplies of scale-free, non-corrosive water for Diesel steam generators.

A Dearborn engineer will discuss a De-Ionizing system to meet the requirements of your operation. The only information required is: (1) Analysis (or sample) of raw water; (2) quantity and quality of mineral-free water required; (3) available space for equipment; (4) raw water pressure and size of supply line; (5) available power characteristics.



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vember 17, 1917, when he became employed in the shops of the Louisville & Nashville at South Louisville, Ky. In November 1919 he became piece work inspector for the Ryan Car Company at Hegewisch, Ill. Mr. Gammon was general car inspector of the Missouri Pacific prior to entering the service of the F. E. C. on August 1, 1925, as general car inspector. He was appointed general car foreman of the Southern division at Miami on April 1, 1929, and at St. Augustine on July 1, 1931.

J. M. HICK, general car foreman of the Great Northern at Hillyard, Wash., has been transferred to St. Paul, Minn., as general car foreman.

HENRY G. HIELSCHER, chief car inspector of the Elgin, Joliet & Eastern, and not of the Illinois Central as reported in the January issue, has been appointed general car foreman at Gary, Ind.

N. E. WESTON, car foreman of the Great Northern at Havic, Mont., has been named assistant master car builder at Spokane, Wash.

O. R. DONOHO has been appointed general car foreman of the Florida East Coast at St. Augustine, Fla.

VICTOR SMALL, assistant superintendent of the car department of the Elgin, Joliet & Eastern, and not of the Illinois Central as reported in the January issue, has been appointed superintendent of the car department at Gary.

CLARENCE C. LARSON, general car foreman of the Elgin, Joliet & Eastern, and not of the Illinois Central as reported in the January issue, has been appointed assistant superintendent of car department at Gary, Ind.

HAROLD D. MCCONAHY, division car foreman of the Erie at Meadville, Pa., has been transferred to the position of division car foreman at Marion, Ohio.

RAYMOND KNORR, division car foreman of the Erie at Marion, Ohio, has retired.

Shop and Enginehouse

VERNON R. COWARD, general foreman of the Southern at Alexandria, Va., has been transferred to the position of general foreman at Hamburg, S. C.

OSCAR L. POND, assistant foreman enginehouse of the Southern at Greenboro, N. C., has been appointed general foreman at Lynchburg, Va.

SAMUEL E. BUTLER, foreman diesel locomotives of the Southern at Alexandria, Va., has been appointed general foreman at Alexandria.

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D. J. EVERETT, master mechanic of the Atchinson, Topeka & Santa Fe at Galveston, Tex., has been appointed superintendent of shops at Albuquerque, N. M.

HENRY A. M. WHITE, foreman of the wheel shop of the Great Northern at St. Paul, has been appointed superintendent of shops at Superior, Wis.

WILLIAM T. CURLEE, general foreman of the Southern at Strasburg, Va., has been appointed general foreman at Durham, N. C.

Diesel

J. W. LUKE, day diesel enginehouse foreman of the Atchison, Topeka & Santa Fe at Argentine, Kan., has been appointed general supervisor of diesel engines at Chicago.

G. R. WEAVER, master mechanic of the Maryland-Delmarva division of the Pennsylvania at Wilmington, Del., has been appointed superintendent motive power—diesel of the Central region at Pittsburgh. Mr. Weaver was born at Huntingdon, Pa. He attended Juniata College for three years, and is a graduate of Purdue Universite (1931). He entered the employ of the Pennsylvania as a laborer on the Middle division in 1929. Following service as a car builder, foreman and assistant master mechanic, he was promoted to master mechanic on the Eastern division early in 1949. He was transferred to the Delmarva division on November 1, 1949.

Master Mechanics and Road Foremen

L. L. LUTHEY, general supervisor of diesel engines of the Atchison, Topeka & Santa Fe at Chicago, has been appointed master mechanic at Galveston, Tex.

F. J. FELLENZER, road foreman of engines, Dakota division, of the Chicago & North Western at Tracy, Minn., has retired.

W. G. HALL, master mechanic of the St. Louis-San Francisco at Kansas City, has retired.

A. R. MARSH, master mechanic of the Susquehanna division of the Pennsylvania at Williamsport, Pa., has been appointed master mechanic of the Maryland-Delmarva division of the Pennsylvania, with headquarters at Wilmington, Del.

BETHEL MANLEY has been appointed road foreman of engines of the Southern at Birmingham, Ala.

Electrical

D. B. THOMPSON, mechanical and electrical engineer of the New York Central at New York, has retired.

HARRY W. WALSH, assistant mechanical and electrical engineer of the New York Central, has been appointed mechanical and electrical engineer, with headquarters at New York.

RICHARD P. TOUSSAINT, assistant engineer of the New York Central, has been appointed assistant mechanical and electrical engineer, with headquarters at New York.

W. K. BOULDIN, electrical foreman at the Roanoke, Va., shops of the Norfolk & Western, has retired.

HARRY F. BROWN, electrical engineer of the New York, New Haven & Hartford, has retired.

A. H. EDMONDS has been appointed electrical foreman at the Roanoke,, Va., shops of the Norfolk & Western. Mr. Edmonds was previously assistant electrical foreman.

J. E. HUDDLESTON has been appointed assistant electrical oreman at the Roanoke, Va., shops of the Norfolk & Western.

Obituary

H. E. WAGNER, master car builder of the ALTON & SOUTHERN, died November 6, in St. Louis.

MARCH, 1952
VOLUME 127
No. 3

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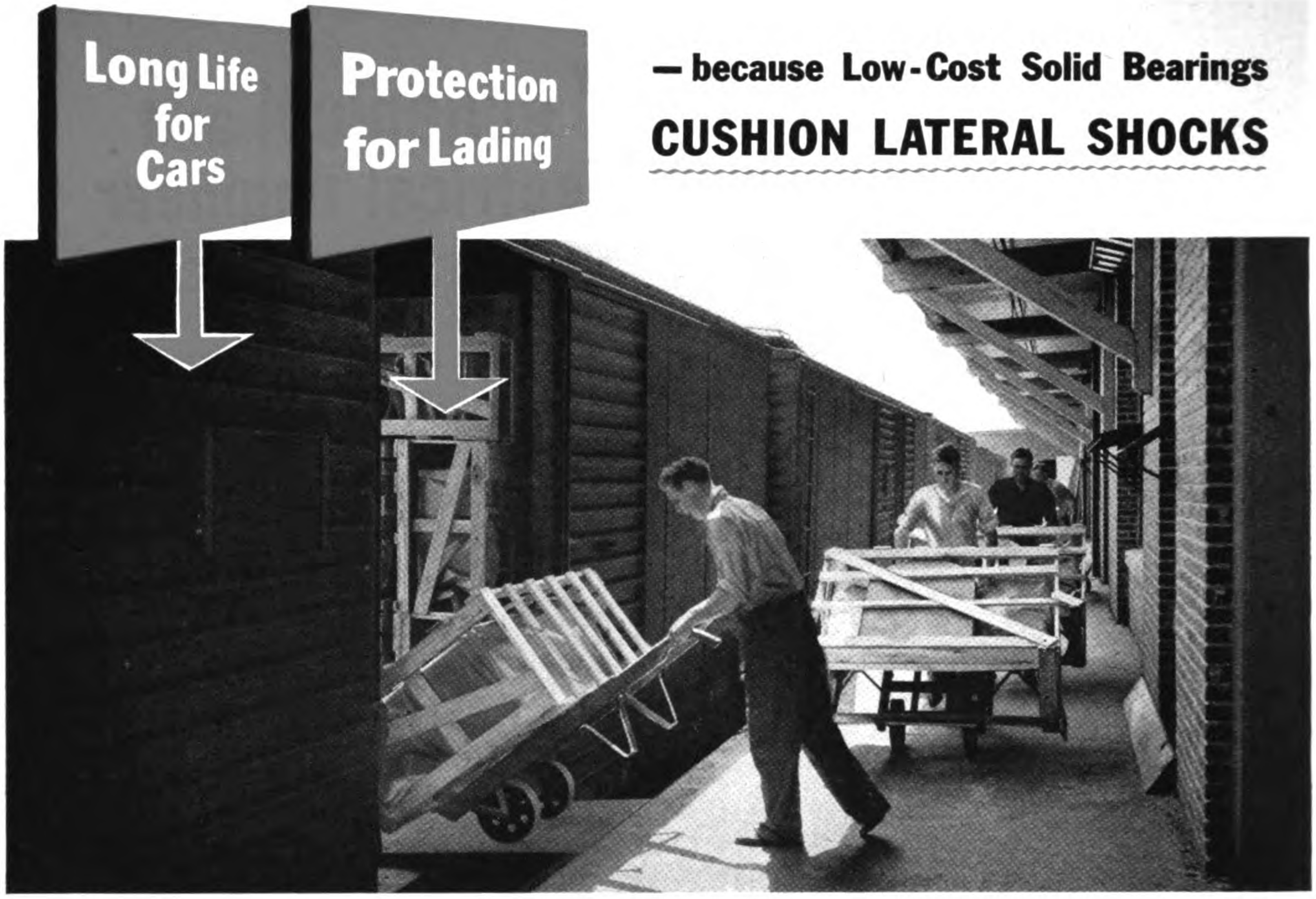

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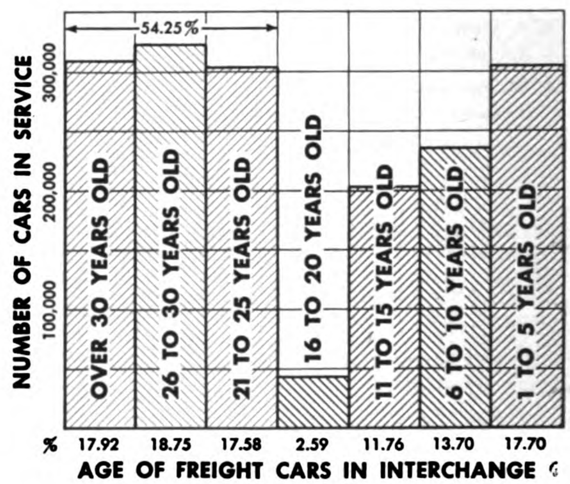

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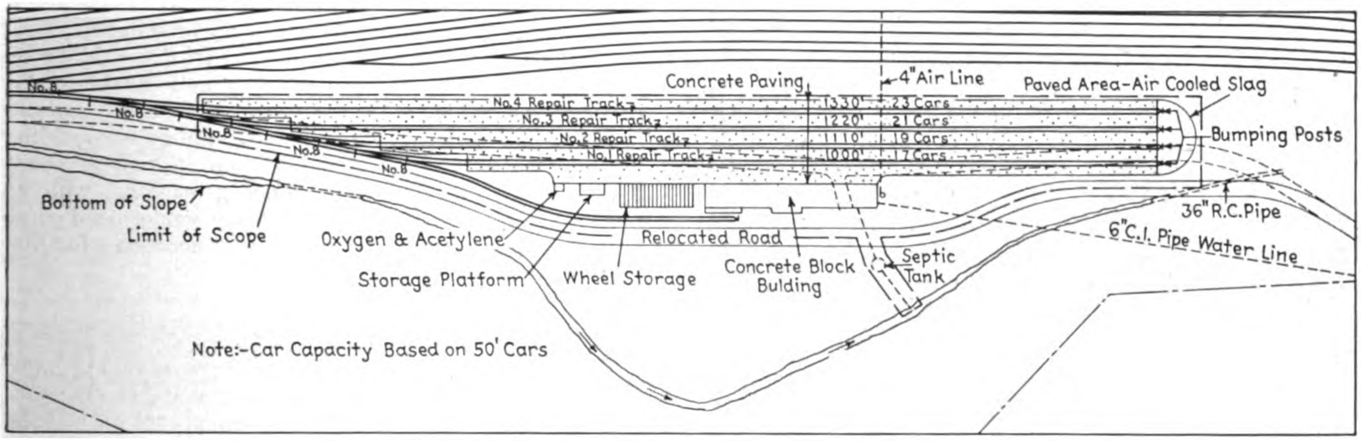
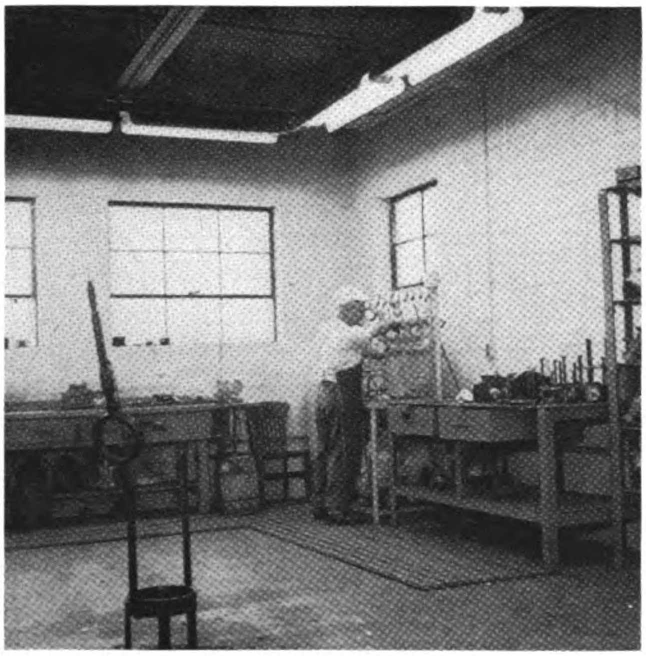


General layout of the North Bessemer freight-car repair tracks

Union Builds Modern Repair Tracks at North Bessemer

Concrete pavement covers working area around four tracks accommodating 90 cars. Shops and storehouse in centrally heated building. Output 60 light repairs daily

Looking south along the front of the shop building



The AB test rack in operation in the air-brake room.

EARLY last fall the Union Railroad inaugurated complete new running repair facilities at North Bessemer, Pa., which include four tracks aggregating more than a mile in length with a capacity for about 90 freight cars. The tracks are level and the area adjoining and between them is paved with concrete. Facilities are housed in a concrete-block structure 215 ft. long, the main part of which is 30 ft. wide. This contains a storehouse, a pipe and air-brake room, a blacksmith shop, a tool room, small paint and oil rooms, an air-compressor room, a locker and lunch room with toilet facilities adjacent, and offices for foremen and clerks. About 48 to 50 men are employed, including foremen and clerks, and the daily output runs about 60 light repairs.

The new facilities are located adjoining the east, or northbound, side of the North Bessemer yard, which is the southern terminus of the Bessemer & Lake Erie, where it delivers lake ore to the Union and receives empties and coal from the Union. Before the new facilities were built the repair tracks were on the opposite side of the yard adjoining the southbound ore yard. Facilities were housed in the usual aggregation of more or less nondescript buildings found at many freight-car repair tracks.

The repair tracks are entered at the south end from a ladder track which extends around to an unloading platform along the east, or back, side of the store room. They are 22 ft. center to center and the space between them is paved with concrete and slag for a width of 14 ft. 6 in., or about to the ends of the ties. The tracks are filled in outside and between the rails for a runway at a point approximately opposite the doorway to the store room, so that heavy material can be moved by crane truck to any part of the working area.

All tracks are served with compressed air and electric welding outlets. Portable oxygen and acetylene tanks are also available. Two 3-in. air lines extend the length of the tracks on the ends of the ties of tracks Nos. 2 and 4. Double outlets with hose connections are spaced 25 ft. apart.

Outlets for welding current are located alongside the west rail of each three tracks, Nos. 1, 2, and 3, at three separate locations or stations along the tracks. From these points welding cables can reach any part of working area.

A three-phase a.c. power outlet and the d.c. welding current conductors that feed underground to the rails and to one group of three outlets are located opposite each group of outlets on the shop side of the tracks. One side of the d.c. circuit is grounded to the rails and the other side is connected to its group of three outlets.

A single portable Westinghouse Type RA welding set with a 440-volt three-phase primary and 300-amp. d.c. capacity can be connected at any one of the three stations.

The entire working area can be covered by one welding machine by moving from one station to another, or a total or three moves or three welding machines with no moves. The main advantage is that the welder need carry only one line and at no time will it be necessary for him to carry lines through or over cars.

The Shops

The main building, which houses the store room, shops, offices and compressor room, is a concrete block structure with a cement floor and a flat roof supported on Gabriel Clerespan joists covered with 2-in. Gypsteel plank and five-ply asphalt roofing. There is no provision for communication between the store room and the various shops within the building. Each is entered from outside and the rooms are separated by solid partitions. Outside walls are 12-in. blocks; partitions, 6-in. and 8-in. blocks. The rooms have a clear height under the joists of 10 ft. 10 in. in the narrower part of the building and 10 ft. 6 in. in the wider part. An exception to this is the compressor room which has a clear height of 14 ft. 2 in. Flourescent lamps are the main source of lighting throughout the building, and illumination is well distributed.

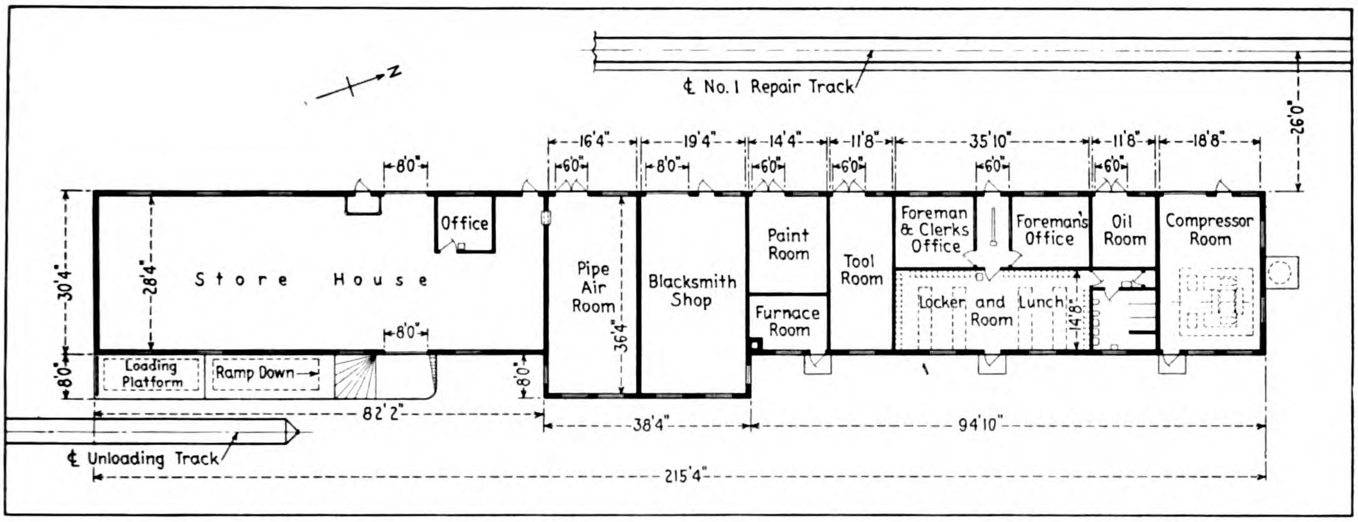
The building is heated by steam from an oil-fired National steel boiler fitted with a McDonnell boiler water control which automatically controls the feedwater supply. This plant has a rated capacity of 1,250 lb. of steam per hour. Distribution is through blower-operated space heaters, except in some of the offices where fin-type radiation is used.

The principal shops are the pipe and air-brake room and the blacksmith shop. These adjoin each other in the wider part of the building. Air-brake work is handled at the east end of the room (the back side of the building). Equipment is provided for cleaning, repairing and testing triple valves and AB equipment. The facilities include an AB test rack, a brake-cylinder pressure-head remover and piston testing equipment. A bench for cutting and bending pipe is placed near the repair-track end of the room. An exception to the lack of communication between rooms is the sash and counter in the partition between this room and the store room. This permits the delivery of material to the air-brake room without going outside. The blacksmith shop has two coal-fired forges and employs three men.

The air-brake room is entered through a 6-ft. double door on the track side only. The blacksmith shop has an 8-ft. sectional lifting door, through which the crane truck can pass, and a 3-ft. single door. These are both on the track side of the building.

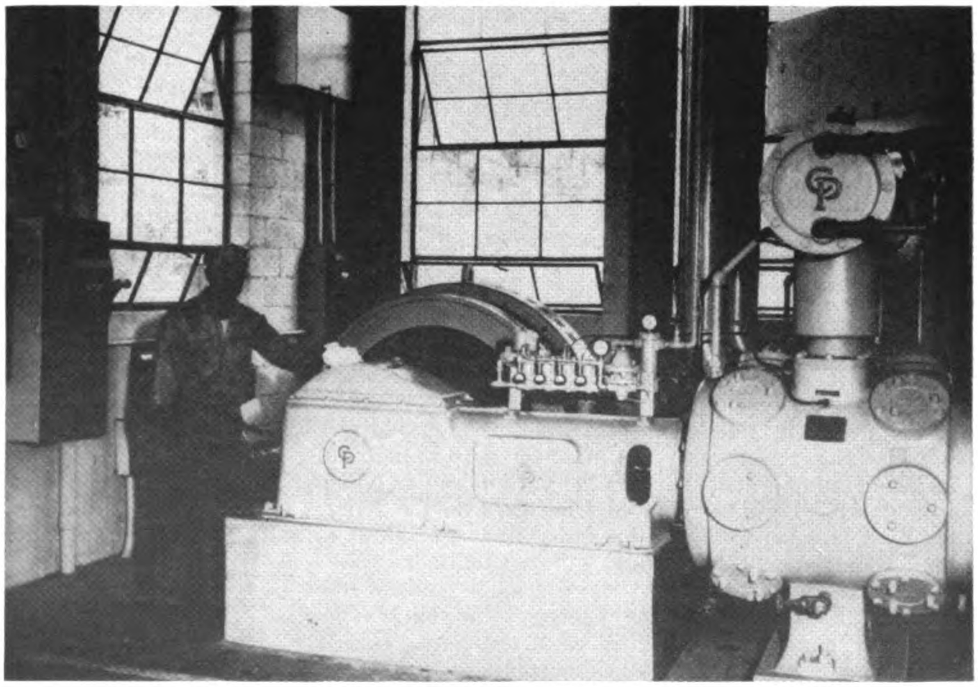
The tool room provides storage space for jacks, air tools and hose, oxyacetylene torches, welding electrode holders and cable, and miscellaneous small tools. This has a 6-ft. double door.

The paint and oil rooms are small. In the paint room are stored paint containers open for use, stencils and

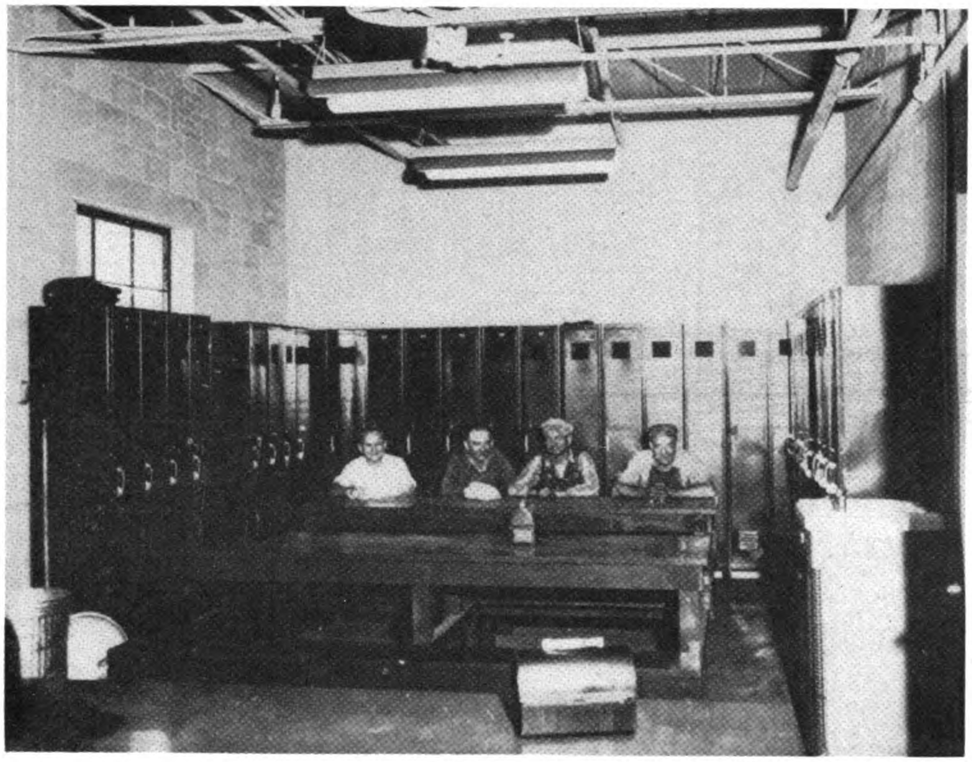


Floor plan of the shop and store building

In the blacksmith shop



The compressor room



The locker and lunch room

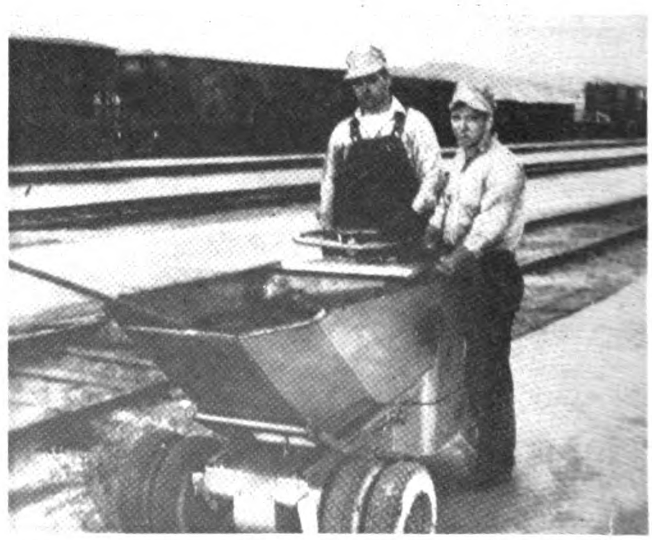
The storeroom

brushes not in use. Facilities and room for the extensive mixing of paint are not called for. In the oil room is stored a working supply of journal-box packing and free oil. Packing is prepared at the main car shop of the road at Duquesne and distributed to the various repair points from there. Packing removed from cars on the repair tracks is shipped to that point for processing. Both of these rooms are entered through 6-ft. double doorways.

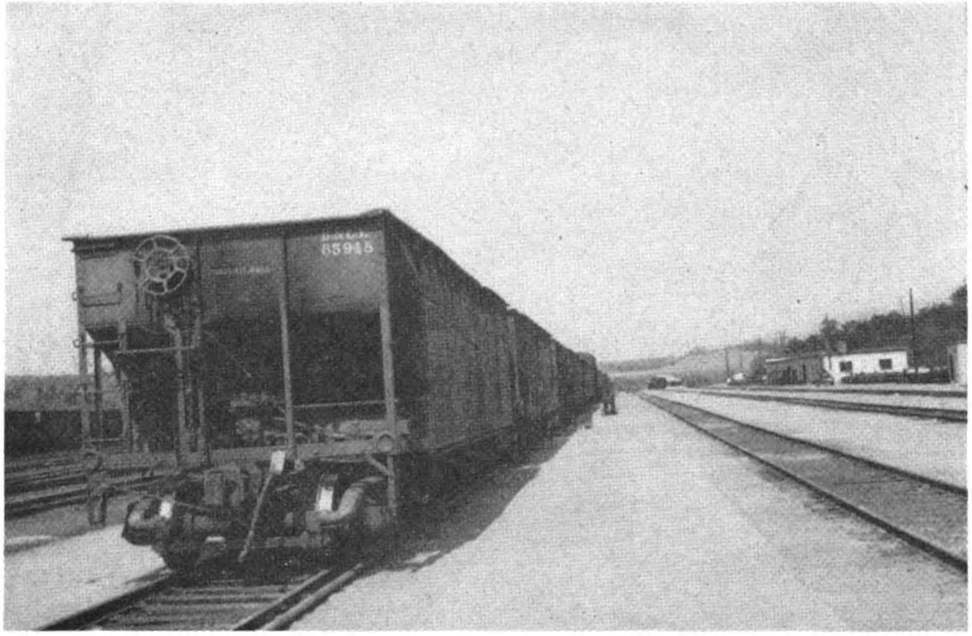
The air-compressor room at the north end of the building houses a two-stage Chicago Pneumatic Tool Company compressor of 1,150 c.f.m. capacity. This is driven by a Westinghouse 200-hp. synchronous motor. An 8-ft. sectional lifting door makes this room accessible to the crane truck.

On the back side of the building behind the foremen's offices is a locker and lunch room and adjoining it at one end a toilet and washroom. This lunch room has tables to accommodate the men who work out of doors. Those employed in the building usually eat their lunches at their regular stations. Between the foremen's offices is the time-clock room. In checking in, the men enter the locker room from the rear of the building, and pass out through the clock room to the track side.

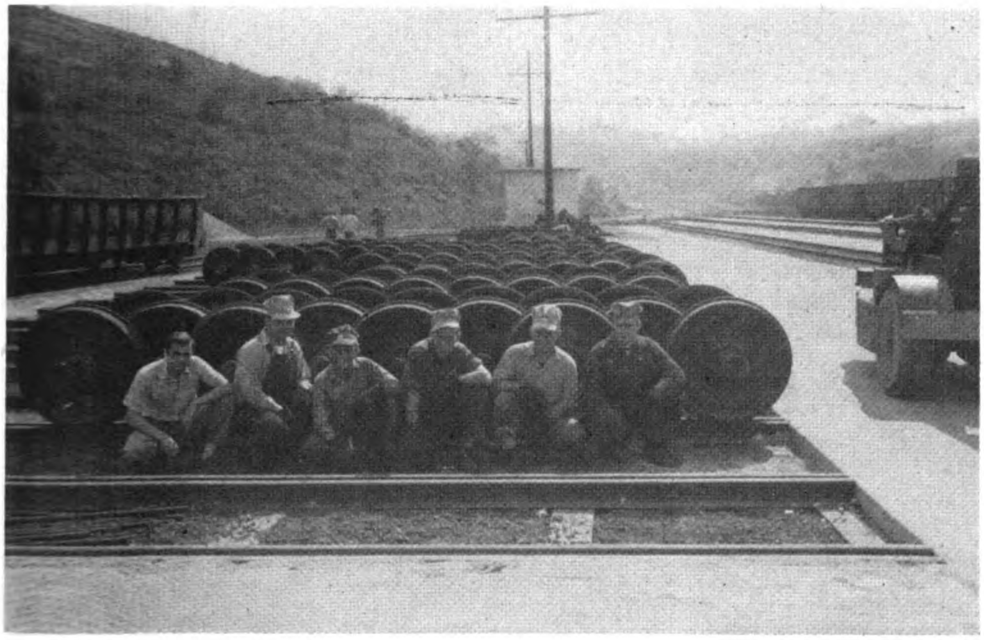
At the south end of the building is the store room. This is 87 ft. 6 in. long by 28 ft. 4 in. wide inside and is equipped with adjustable steel shelves. The storekeeper's office is partitioned off from this space near the north end



The motor-driven barrow



Looking north between tracks Nos. 3 and 4. The shop building is seen at the right



Looking south over the wheel storage tracks

and is accessible only from the inside. Sectional 8-ft. lifting doors are located opposite each other in the front and back walls. That on the back side opens at the foot of the ramp from the freight-car unloading platform.

Adjoining the store room on the south are the outside wheel-storage tracks. Wheels can be loaded and unloaded on cars on the storehouse track by the crane truck. The same truck moves them to and from the repair tracks.

At the south of the wheel-storage tracks is a platform for brake beams and car castings including couplers and truck castings. Beyond this is the building for storing oxygen and acetylene.

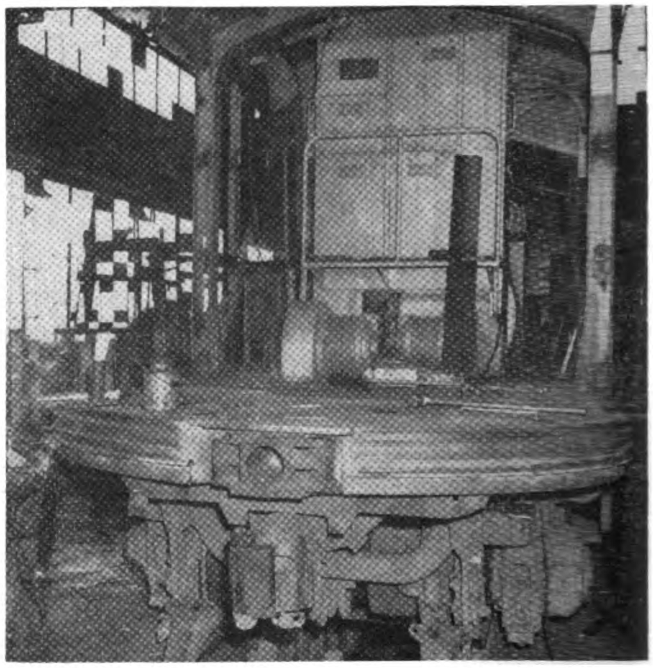
Two motor-driven vehicles do the material handling about the plant. These are the five-tone crane truck to which reference has already been made, and a motor-driven dump barrow. The crane truck takes care of the unloading of heavy material and distributes heavy parts about the working area. The barrow distributes smaller materials and collects and disposes of waste materials.

The new facilities were placed in service on Monday, September 10. The repairmen worked on Friday, September 7, at the old yard, then spent Saturday in loading tools and material for the move. The cars were moved and unloaded on Sunday. On Monday the men turned out 48 repaired cars on the new tracks.

The Union Railroad averages an output of about 200 repaired cars per day from seven repair points. With the exception of the main car shops at Duquesne, where the shops turns out rebuilds and heavy repairs and the outside repair tracks turn out both heavy and running repairs, all these points are light repair tracks. Of the 60 cars repaired daily at North Bessemer, about 75 per cent are homeward bound to the B. & L. E. Ninety per cent of them are open tops and five per cent box cars.

◄ Putting the new windshield section in place. The new nose framing and sheets have been applied

▼ Front of the stripped unit during application of the new anti-climber



GM B-Unit Converted into an A-Unit

T. P. & W. builds new nose on power unit in its own shop to make an additional locomotive for road service

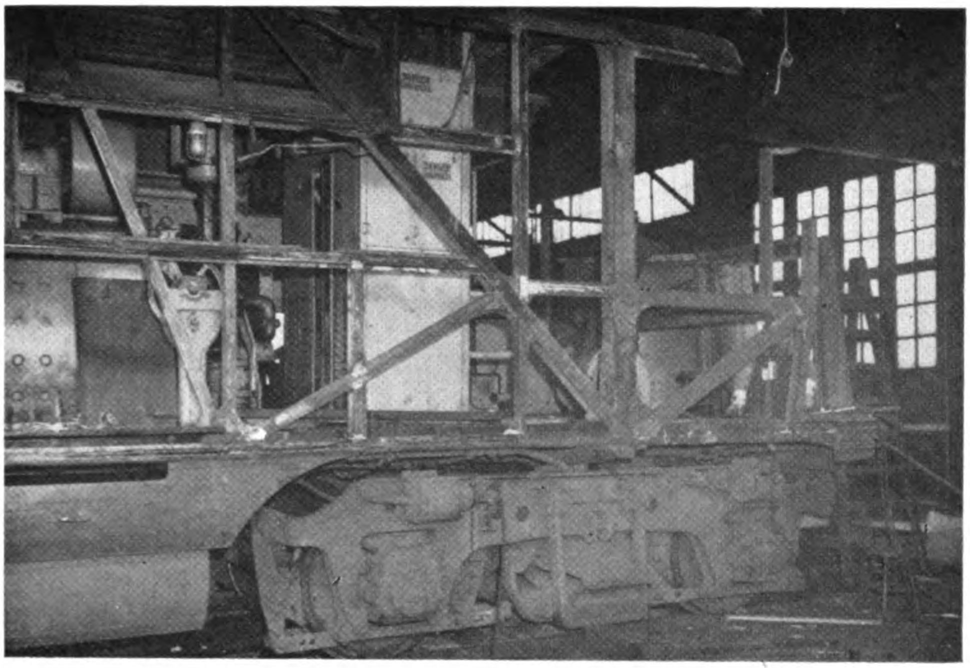
THE first diesel locomotive purchased by the Toledo, Peoria & Western consisted of one A and one B unit built by General Motors. When operating experience with this locomotive demonstrated that the added flexibility which could be attained from a combination of two A-units would be highly desirable, the road decided to make the necessary changes in their own shop to convert the B-unit into a second A-unit.

The first step in the conversion was to strip the frame completely on the steam generator end from the collision braces forward. A new round end platform was fabricated and welded in place. New framework members were made and welded into place forward of the collision braces on each side with the exception that the old roof brace arch that joins the collision post at the frame was retained. A new front framework was built and applied to conform to the contour of an A-unit nose.

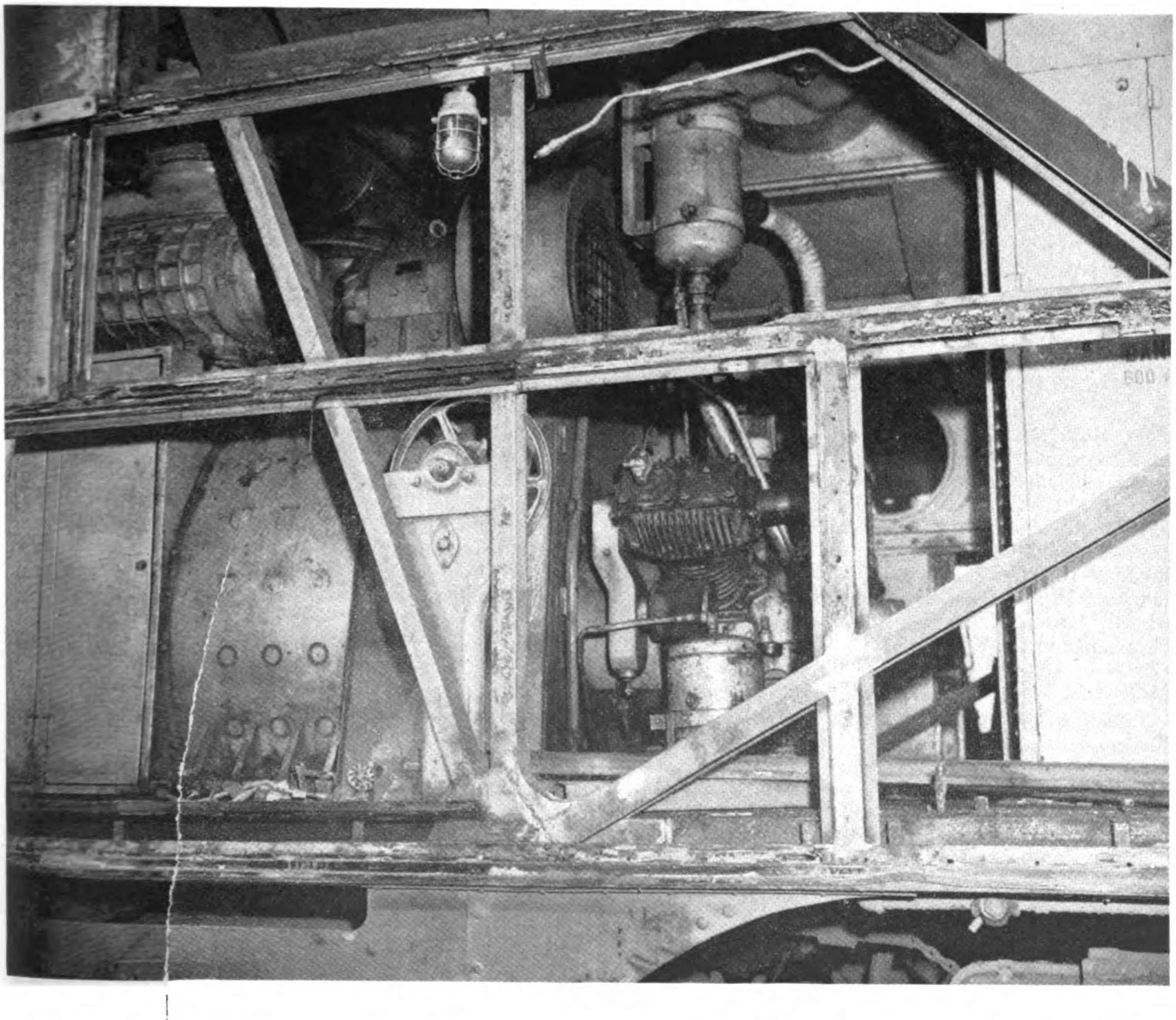
The original draft gear and coupler were used, but a new buffer assembly, pilot and anti-climber were purchased. New hood sheets and side sheets forward of the collision braces were bought and applied; also doors, windshield, headlight and classification lights. A new cab platform was made in the shops.

Other new equipment purchased included a control stand, instrument panel and cab heaters. Rewiring and changes in the air piping and sand boxes were done as necessary. The electrical cabinet was left intact. The 24-RL brake equipment was removed, and 6-DS substituted to conform to the air brake equipment on all other T. P. & W. diesel units.

➤ The B-unit was stripped forward of the collision braces, and new framework and anticlimber applied. The existing roof brace arch was retained



▼ A portion of the new side framing



Changes in Interchange Rules†

By T. J. Boring*

PRICES for repair materials are revised by the A. A. R. Committee on Prices for Labor and Materials by checking in spring and fall through quotations obtained from the purchasing agents of ten railroads representative of all sections of our country, including one Canadian road. To the average material costs are added seven per cent stores expense, one per cent interest on stock investment and approximately one per cent for commercial and deadhead freight haul; see Interpretation No. 1 to Rule 105. Labor rates are similarly checked, and to these weighted averages are added percentages to cover overhead expenses (62.54 per cent), railroad retirement (6¼ per cent) and unemployment insurance taxes (½ per cent), and vacations with pay (3 per cent), as described in preface to Rule 107. All price revisions, including reproduction prices for destroyed cars in Rule 112, are also subject to approval by the Arbitration Committee.

Billing for car repairs is an important and necessary part of our general subject as it is the final result and is greatly influenced by practically all the Rules. No person knows how much this totals per year now, although about 12 years ago a survey made by the A. A. R. showed almost $31,000,000 freight car repairs billed in year 1939 by railroads, of which almost $10,000,000 or 32 per cent represented repairs to private line cars. This excluded repairs to passenger equipment cars, repairs on defect cards, "No bill" repairs, destroyed cars, and billing by private car lines. Totals today would be much higher due to the large increases in subsequent prices.

There is no definite means of checking these car repair charges between car owners, except the restrictions set up under the Rules, the Arbitration Committee, and the A. A. R. Mechanical Inspection Department operating under Rule 124. The spirit of common honesty is largely dominant and recognized by all car owners.

In taking up the changes made in the Rules effective January 1, 1952, I will not discuss, to any extent, those that were issued in Supplements No. 1 and 2 of 1951. Therefore, since important changes have been made, they should be carefully studied and the requirements strictly followed. In addition to the "Changes from 1951 Rules" printed in front of the Rule book, attention is directed particularly to the following:

Rule 2

Section (b), second paragraph—Modified to indicate that in addition to flammable liquids, cars carrying other liquids classified as dangerous, must be repaired or transferred, without any unnecessary movement or at nearest available point when leaking.

Section (c), first paragraph—Modified to clarify the intent that authority for transfer or for rearrangement of lading is intended.

† Part I of an abstract of a discussion of the changes in Interchange Rules presented at a meeting of the Eastern Car Foremen's Association, New York, February 8.

* General foreman, M. C. B. Clearing House, Pennsylvania Railroad, Altoona, Pa.

Rule 3

The effective dates of the following Sections have been extended to January 1, 1953, which is in addition to change in several Sections listed below to read "In interchange" instead of "From owners."

Section (b-7)—Metal badge plates (brake levers).

Section (b-9)—Required brake power percentages.

Section (c-11)—Old style couplers having 5 by 7 shank.

Section (c-12)—*E* type couplers, bottom rotary operated, not equipped with assembled riveted type lock lift lever and toggle.

Section (c-13)—Maximum 1½-inch vertical clearance between top of coupler shank and under surface of striking face of striker casting.

Section (d-4)—A. A. R. Alternate Standard or A. A. R. approved equivalent, draft key retainers. Rule 18-g permits application and charge for the A. A. R. approved *Positive* lock to OK former A. A. R. Standard *T* type retainers which thus makes that retainer A. A. R. Alternate Standard, there being no A. A. R. Standard (see list on page 220, also Item 42 of Rule 107 for 0.2 hour labor charge).

Section (t-3-b)—Cast-steel truck side frames having *T* or "L" section compression or tension members; also modified to provide that effective January 1, 1954, cast-steel truck side frames having *I* section compression or tension members will be prohibited under all cars. From owners.

Section (t-3-f)—Cast-steel truck side frames to which repair patches or reinforcing plates have been applied.

Section (w-4)—Single plate non-bracketed cast-iron wheels of 700 and 750 lb. weight regardless of date cast.

Section (t-6)—Modified to indicate that tightening of bottom outlet valve caps must be done by the use of not less than a 36-in. wrench as required by I. C. C. Regulations, which formerly specified a 48-in. wrench. The Regulations also positively require that all caps of bottom outlet valve legs or castings (and of heater coils) must be left off during process of loading tank cars, and the inside bottom outlet valve must be in closed position.

Section (u-4), Note following—Eliminated account non-acceptance of Class E-3 underframe (no center sill cover plate) cars from owners effective January 1, 1952.

Section (w-4), first Note following—Reference to cast-steel wheels added account limited quantity of experimental cast-steel wheels marked "A.A.R.X.-2" and "A.A.R.X.-3" authorized for use under freight cars. See new Paragraph (c-8) of Rule 98 for disposition and credit when removed from service.

The provisions of the following Sections have been modified to indicate that same will now apply to cars "In interchange" instead of "From owners":

(b-6)—Brake beam hangers designed with eyes which are not formed solid, prohibited on all cars.

(b-10)—Brake shoes meeting requirements of A. A. R. Specifications adopted in 1935, required on all cars.

(*d-3*)—Requirements for draft key retainers on cars built prior to January 1, 1950.

(*h-5*)—Hand brake connection between brake staff and rod, must be of chain.

(*r-3*)—Refrigerator cars must have the hatch covers secured by hinges.

(*s-4*)—Stenciling: Light weight and capacity in pounds, as provided in Rules 30 and 86, required on all cars.

(*s-5*)—Stenciling: Load limit markings, as provided in Rule 30, required on all cars except tank cars and live poultry cars.

(*t-17*)—Plugs in heads of tank cars must be of the solid type, with *S* cast or stamped on those applied from the outside.

(*u-1*)—Requirement for minimum cross sectional area of 24 square in. for center sills between draft back stops on cars other than tank cars built new on or after January 1, 1927, or rebuilt on or after January 1, 1928.

Rule 4

Section (*b-1*): Modified by eliminating the words *whether or not associated with other cardable damage,* account addition of new Interpretation No. 4, which makes slight damage cardable on car extensively damaged due to unfair usage.

Section (*g-1*): Modified to clarify the intent that safety appliances are in the category of "associated unfair usage damage" in connection with end sill repairs on or off car.

Section (*K-2*): Modified to indicate that road which issues defect card not bearing notation "Home for Repairs," may, at its own discretion, also issue additional defect card to cover uncarded, unconcealed, associated, unfair usage defects where so requested by car owner submitting joint inspection certificate.

New Interpretation No. 4—Added to clarify the intent that defect cards covering cars extensively damaged due to unfair usage, should cover all damaged parts even if damaged to lesser extent than set forth in Sections (c) to (h). This feature should be particularly kept in mind when preparing joint inspection certificates covering uncarded damage on cars sent home with only major defects covered by defect card. This ties in with change mentioned above under Section (b-1) of this Rule 4.

Rule 7

Paragraph No. 4—First paragraph modified to require only the signature of the person authorized to vouch for the correctness of the repairs on billing repair cards. Former practice of having the signature of the foreman stamped or written on the billing repair card, in addition to the signature of the party supervising or making the repairs, may be continued if desired.

Rule 8

Second paragraph—Eliminated account few if any cars of private ownership are now equipped with receptacles to contain copies of billing repair cards.

Rule 9

Wheels and Axles, R. and R.—Requirement to show *1WT* for turned *1-W* wrought-steel wheels deleted due to change in Rule 98, Section (i), eliminating charge and credit for same on service metal basis and substituting "scrap" or "secondhand," the same as for unturned 1-W wrought-steel and for cast-iron wheels. It will no longer be necessary to record on repair records, the over-all thickness of tread before turning or the sixteenths of service metal after turning, as was required by the Note under Rule 98-i-1 of the 1951 Code. Simply show the defect or secondhand for the wheels as removed regardless of whether you can or do turn the wheels for your own account. Remount gage is not to be used on *1-WT* wheels which should be shown as secondhand if serviceable.

Brake beams, R&R—Modified to provide that it is no longer necessary to show "A. A. R." with "No. 18" beams applied or removed. Just show "No. 18" and Certificate of Approval number per Identification Table Figure-2 shown on page 215, charges and credits shown on page 208.

Rule 16

Last paragraph and Note—Deleted account lack of adequate facilities and trained personnel on most roads for performing the work of testing safety valves. This work is usually done by car owners. Furthermore, the I. C. C. has waived the requirements with respect to testing of tanks and safety valves until further orders of the Commission, as shown in the Notes under Interpretations Nos. 1 and 2 of Rule 3.

Rule 17

Section (*c-2*), *Coupler and Knuckle substitution table*—Knuckle items 26, 28 and 30 modified to provide for secondhand credit for D type knuckles removed in good condition instead of average credit account latter eliminated from Items 132 to 132-E of Rule 101, effective January 1, 1951.

Section (*e*), *Note 2 following*—Modified to provide for permissible substitution of the No. 1880 sliding chair in place of the No. 1656 or No. 1293-B on brake beams having third point suspension. The No. 1880 sliding chair is designed for beams having a flat strap tension member.

Note 3—Modified by addition of new last paragraph to provide for application and charge for fourth point sliding chairs on No. 18 brake beams applied and 50 per cent credit for serviceable sliding chairs removed which cannot be transferred to the particular No. 18 beam applied, but are transferable to other beams.

Section (*i-1*)—Modified by adding new last sentence indicating that provisions of this section also applies to draft gears approved for cars of special construction as listed in new Section 1-A of table under Rule 101, as to substitutions and any increased cost.

Rule 19

Item 10—Modified by adding "secondhand or secondhand rebroached" journal bearings to materials prohibited in making repairs to foreign cars. Such bearings must be used only in making repairs to system cars.

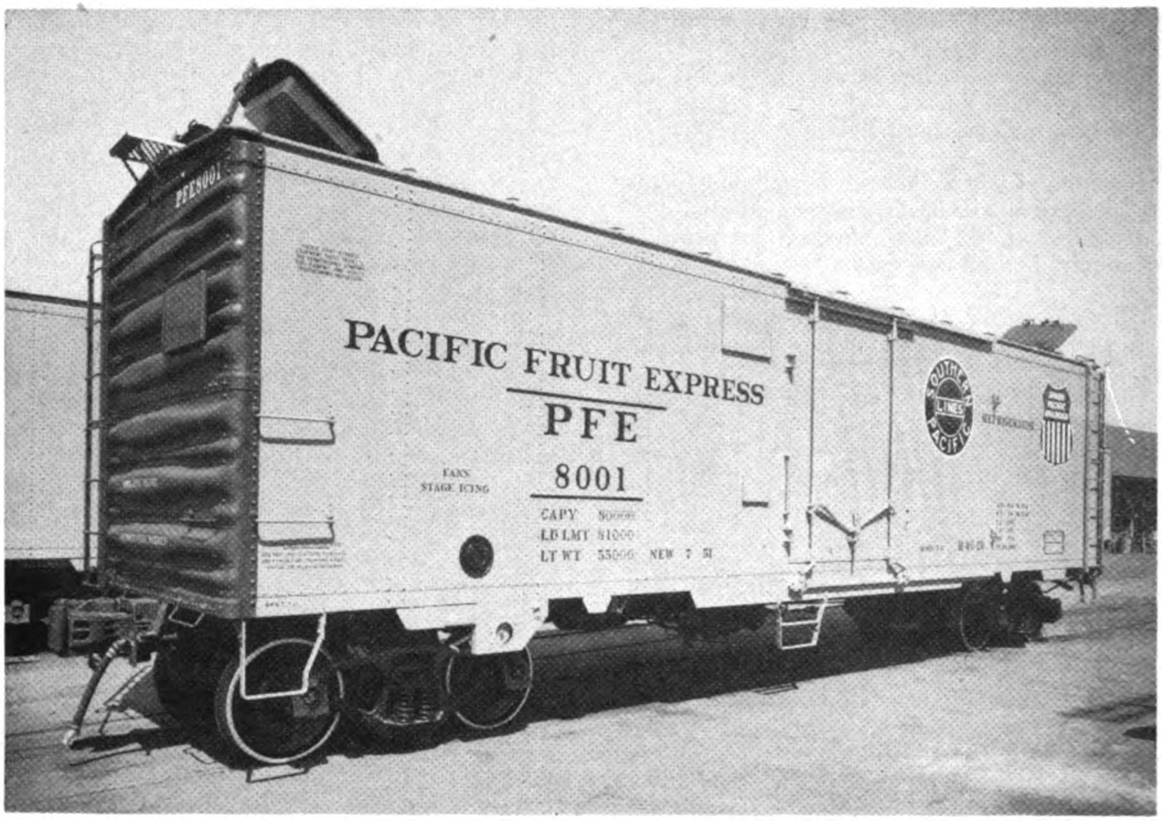
Rule 20

Section (*e*)—Modified to clarify the intent that dimensions shown apply to coupler height and not to height of car.

Rule 22

Text modified and present Figures 13-B, 13-C and 13-G revised to clarify the intent and to provide for the repair reinforcing of channel type center sills by welding. New Section (11) and new Figure 13-I added to provide for center sill repair for cars having A. A. R. *Z* section center sills broken at rear of draft key slot. These provisions should be strictly followed when making center or side sill repairs to foreign cars.

(*To be concluded in the April Issue.*)



P.F.E. Builds 40-Ton Refrigerator Cars

2,000 cars are equipped with 6-ft. wide sliding doors, 2-stage icing, stronger composite wood-steel floor racks and dual 3-unit electric-driven air-circulating fans

The Pacific Fruit Express Company now has under construction at its own shops in Los Angeles and Colton, Calif., 2,000 steel-sheathed, wood-lined 40-ton refrigerator cars, Class R-40-26, which will add materially to the fleet of modern all-purpose cars operated by this company, improve standards of service and reduce maintenance costs by replacing a considerable number of older worn-out cars. The cars are equipped for two-stage icing. They have 6-ft. wide sliding doors and composite wood-steel floor racks designed with adequate strength for pallet loading. The electric air-circulating fan equipment was developed by Preco, Inc., Los Angeles, Calif.

The inside dimensions of the P. F. E. refrigerator cars are 33 ft. 2¾ in. long between bulkheads, 8 ft. 3 in. wide and 7 ft. 4½ in. high above floor racks. The cubic capacity, between bulkheads and above floor racks, is 2,022 cu. ft. The capacity of both ice tanks (chunk ice) is 11,500 lb. which is reduced to 6,500 lb. for stage icing. Modern trucks with long-travel springs and built-in friction snubbers are equipped with steel wheels and weigh about 6,600 lb. per truck. The trucks on this group of cars were furnished by American Steel Foundries (Type A-3 Ride Control); Standard Car Truck Co. (Type S-2-C stabilized); National Malleable Steel Castings Co. (Type C-1), and Buckeye Steel Castings Co. (Cushion Ride). The light car weight including trucks is approximately 54,500 lb.

The car underframes are welded open-hearth steel by the Consolidated Western Steel Corporation. The superstructures are a combination of riveted and welded construction. The Standard Railway Equipment Co.'s two-piece corrugated steel ends and solid riveted steel roofs are used. The ends are strengthened with a welded reinforcing beam riveted to the corner posts at each end.

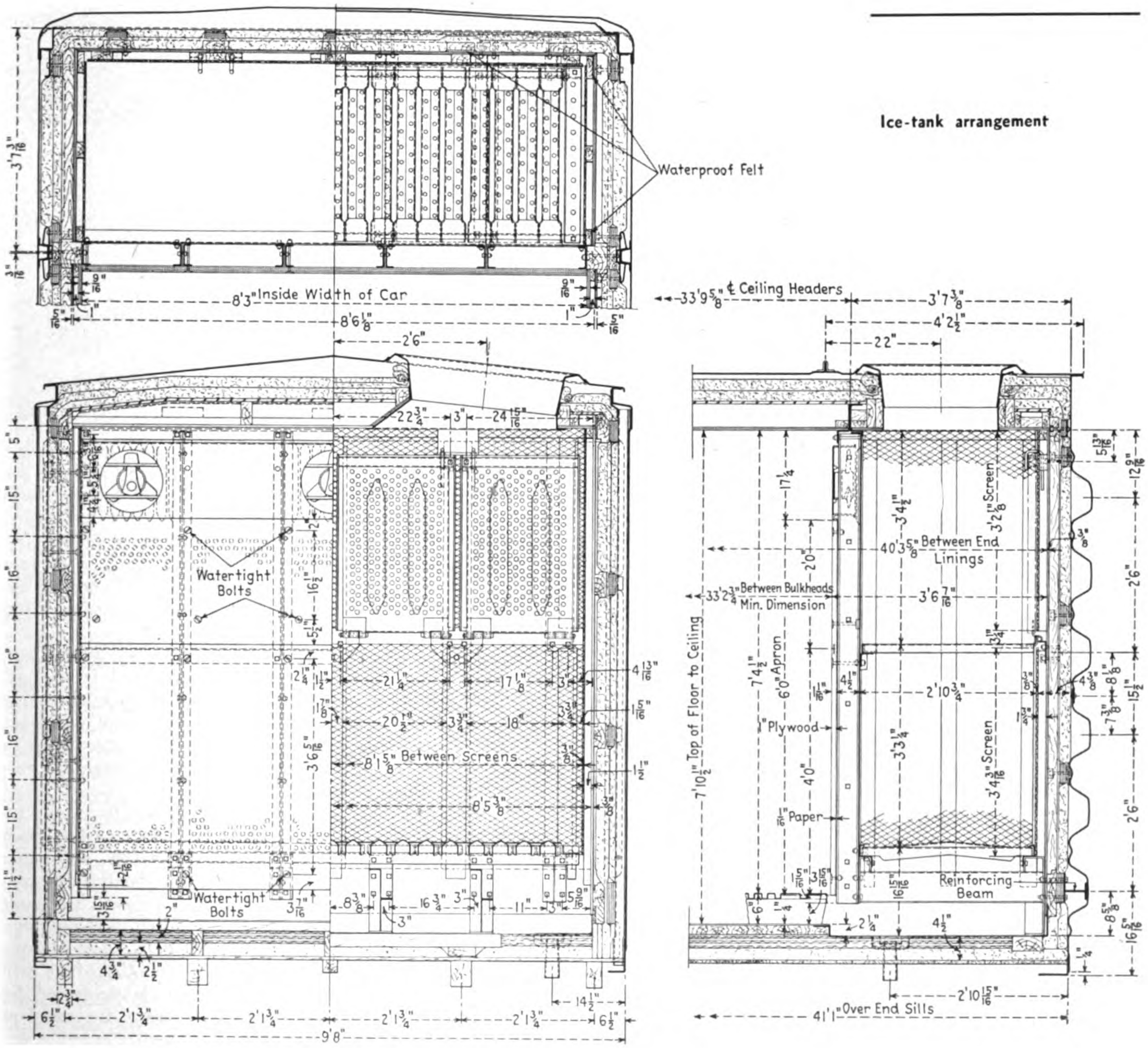
Belt rails and coping boards are Douglas fir and extend

from door posts to corner posts, being bolted to the steel framing. The fir door posts are bolted to the door steel Z-bars. Inside lining consists of 9/16-in. plywood side and ceiling panels and ⅜-in. panels at the ends. The sub floor consists of wood sub-sills bolted to the underframe and covered with ¾-in. by 3⅝-in. straight-edge boards. Intermediate and center floor stringers are toe-nailed to the sub floor and a 1¾-in. by 5 1/16-in. tongue-and-groove upper floor applied.

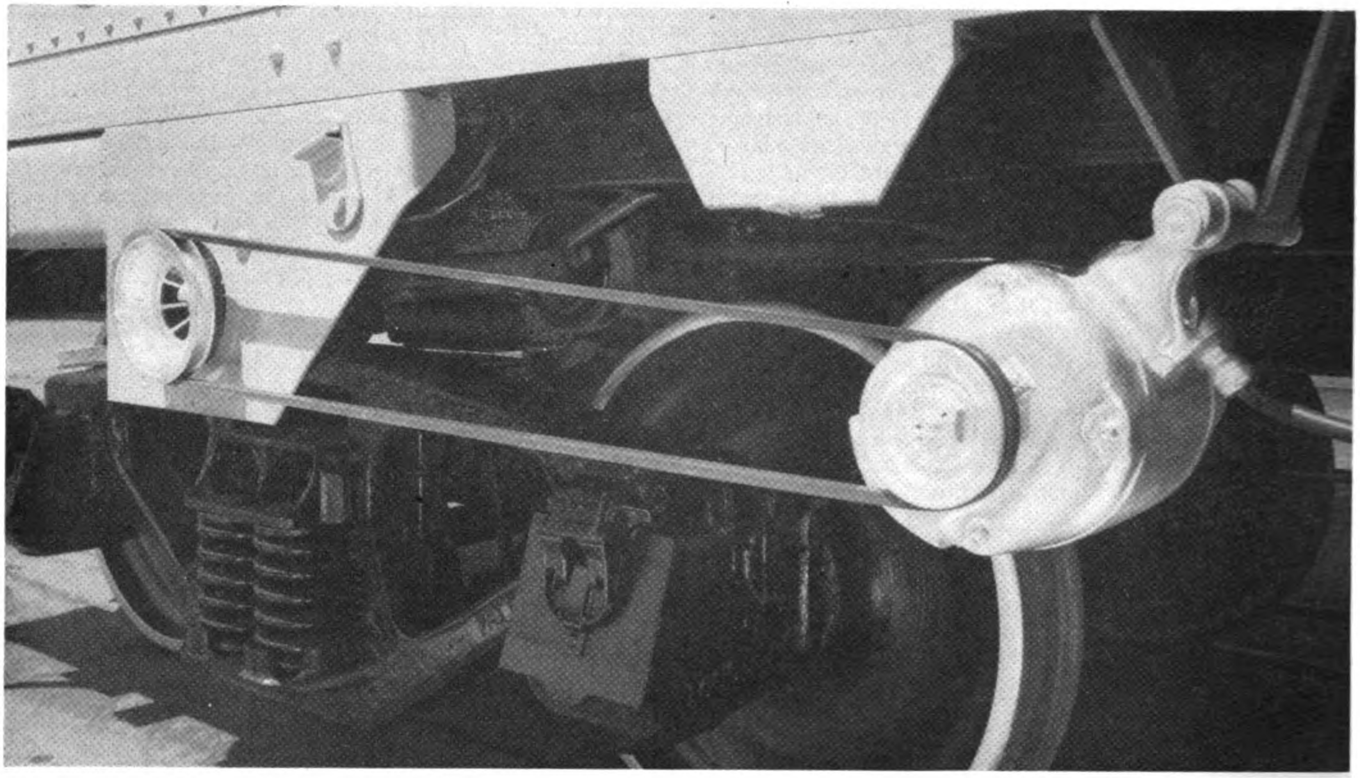
The floor insulation consists of one lower course of 2½-in. fibrous-type insulation and one top course of 2-in. plastic multi-air-layer insulation. The car floor is made water tight in the usual manner with asphalt water-proofing materials and the floor pan is set in caulking compound at the front edge and side openings. Floor racks are of the herringbone type with galvanized metal slats on Douglas fir stringers, designed for lift truck operation, as mentioned. They can stand an 1,800-lb. concentrated load without exceeding the metal yield point. These racks are hinged to the car sides with cast steel hinges.

After assembly, the inside surfaces of steel sheathing, steel ends and side plates are sprayed with 3/16 in. of corrosion-preventing insulating material. Wall insulation consists of two 2-in. thick blankets, the outside course being applied in one piece from door post to corner post and between the corner posts. The inside blanket, however, extends from door post to door post around the end of the car in a single piece. One layer of approved reflective type insulation is applied in side and end walls, adjacent steel sheathing and steel ends, the single reflective surface in each instance facing either the wall air space or outside of the car.

Roof insulation consists of one top course of reflective material (bright surface up), two intermediate courses of 2-in. blanket insulation, one bottom course of ½-in. thick board insulation. Hatch plugs have the same kind and thickness of insulation as specified for the car roofs.

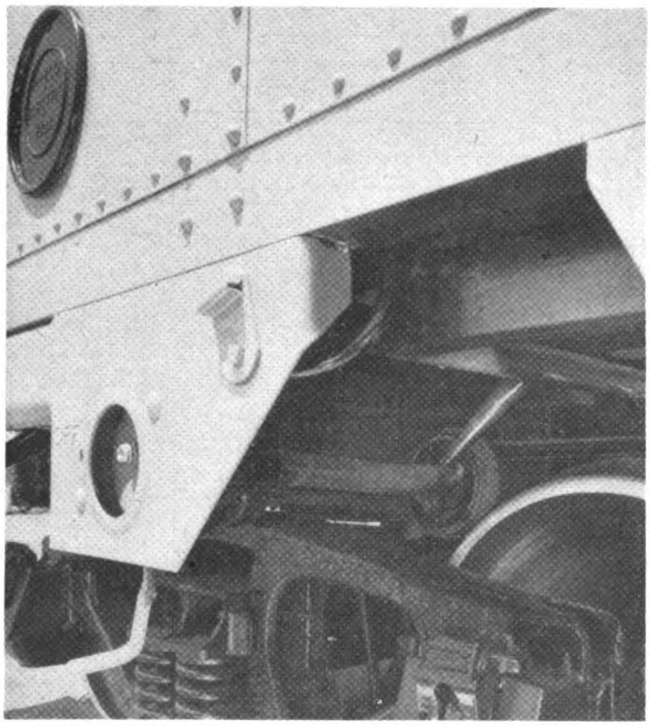


Ice-tank arrangement



Electric precooling motor in operating position. The alternator assembly is in off position for precooling

Alternator assembly in on position



The 6-ft. sliding side doors utilize the same general type of construction and insulation as the side walls. They are made to jigs and templates for interchangeability and each door is carefully fitted to the openings to prevent air leakage. Door fasteners are adjusted so that, when operated, doors are forced tightly closed. A fixture near the lower edge of each door engages a fixture on the car side to hold doors in the open position.

Air-Circulating Fans

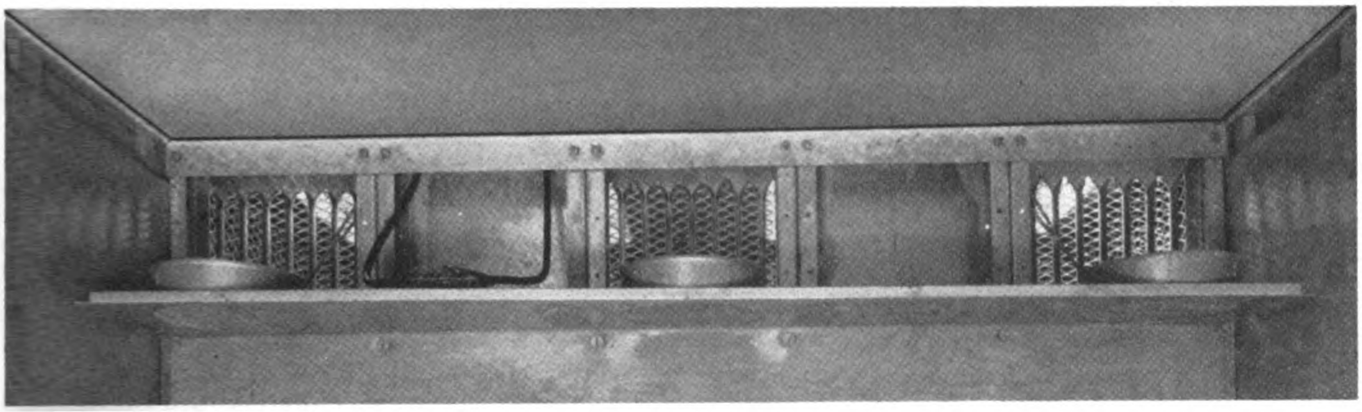
The Preco Type AA electric fan system consists of one alternator with connections to three motor-driven fans mounted at the top of each bulkhead blowing cooled air from the ice bunkers over the top of the load instead of forcing air into the ice bunker at the bottom. A permanent-magnet, low-voltage, three-phase system is used without commutators, slip rings, brushes, or batteries. For ease in servicing the fans, wiring and fuse block are supported in a hinged three-unit fan panel which fits in the top of each bulkhead. These panels may be turned down to a horizontal position for inspection or repairs.

The alternator is driven by a friction wheel in contact with the tread of a truck wheel. The drive wheel is directly coupled to the alternator by a shock-absorbing coupling, without belts.

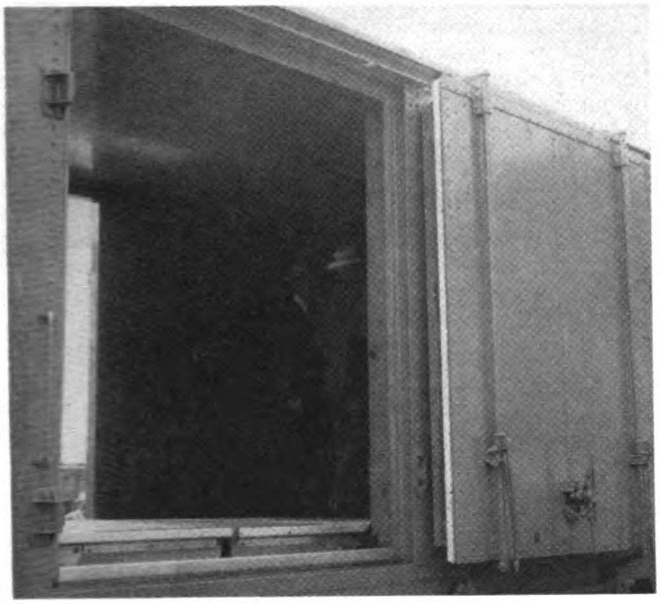
Fans with high-efficiency airfoil-type stub blades are pressed on the motor shafts. The fan speed is proportional to the car speed and fans always turn in the same direction. One car set of six fans is designed to deliver increasing amounts of free air at various speeds up to 11,000 cu. ft. per min. at 69 m.p.h. and at various pressure heads up to 1.2 in. of water.

To keep the fans rotating in the same direction, regardless of the direction of car travel, two of the three alternator phases are interchanged by an automatic reversing switch which operates within the first revolution of the alternator or drive wheel. This switch is built into the alternator. There is no other switch in the system.

Each motor is individually protected by fuses. If one of the fans is stopped by accident, the other fans will continue to operate. The entire system is protected by fuses near the alternator. The motor fuses are rated at 5 amp. and the alternator fuses at 30 amp.



The three-unit fan assembly suspended by safety chains is readily accessible for inspection and servicing



The 6-ft. sliding door in open position

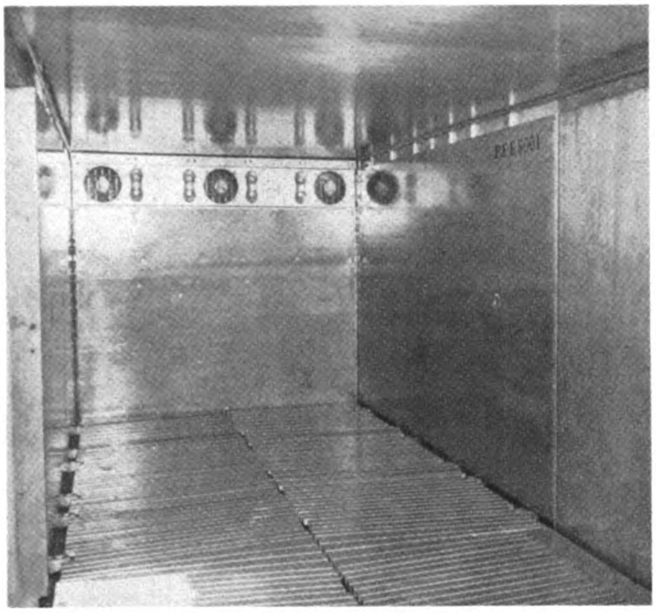
The alternator and motors, all of which are completely enclosed units, are supported on rubber shock mounts. The bearings do not require service lubrication.

Method of Precooling

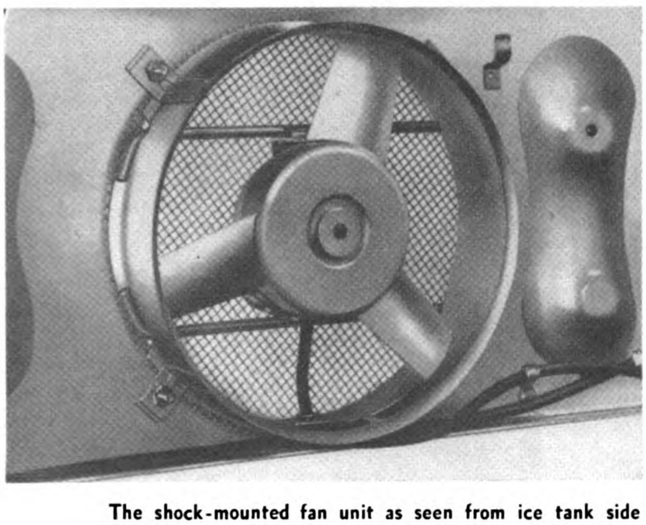
For precooling, the alternator drive wheel is lifted off the car wheel. A special sheave is then mounted on the alternator shaft extension, and the alternator driven by V-belt from a portable motor attached to the car under frame. Only one such motor is used for each car. The special sheave attached to the alternator is intentionally made different from the precool sheave used with floor-type fans and incorporates a blower to cool the alternator during stationary precooling. A 2-hp. three-phase motor with 5-in. sheave diameter is recommended for use with electric fans.

The frequency and voltage of the system vary in proportion to the car speed. At 70 m.p.h. the frequency is 140 cycles per second and the voltage 46 volts. With six fans the current is 27 amp. and the total power output 1.5 kw. at 70 m.p.h.

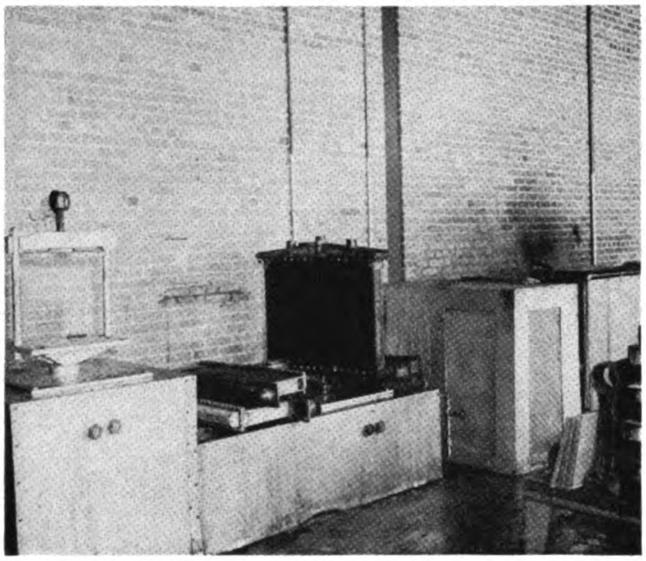
Curves for power, current, voltage, and fan speed plotted against car speed show that. Relatively high current is developed at low car speeds which causes the fans to turn as soon as the car moves.



The inside finish, metal slat floor racks and three-unit fan panel in the top of the bulkhead



The shock-mounted fan unit as seen from ice tank side



One corner of the room is devoted to cleaning, testing and storing radiators

Cleaning Room for All Types of Filters

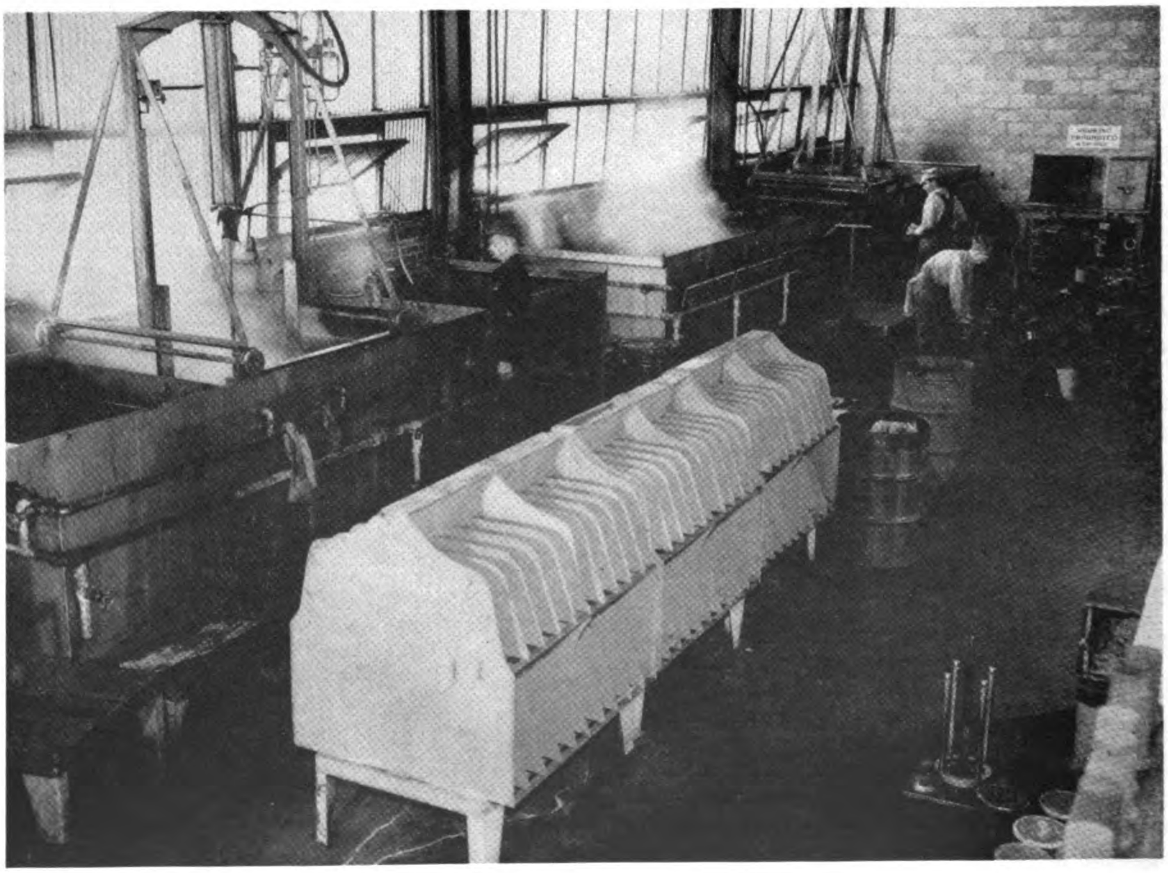
The Southern has a filted cleaning room at the Chattanooga, Tenn., shops which employs automatic cleaning for all types of diesel locomotive filters—engine air filters, car body air filters, cylindrical lubricating oil filters, lubricating oil strainers, cylindrical fuel oil filters and cabinet-type air filters. Three banks of cleaning tanks are installed in the room, one for filters, which is automatic in operation, a second for iron and steel parts and a third for aluminum parts.

Filters to be cleaned are put in a rack which is suspended from the bottom of an air piston. They are lowered into a boiling solution of Pennsalt 45X and left for 15 minutes. From here the rack and filters are transferred into a solution of boiling rinse water for two minutes, and thence into a bath of hot lubricating oil for another two minutes. All raising, lowering and horizontal movement of the filters is automatically timed and controlled. After draining, the filters are put in steam heated dryers for two or three hours. Lubricating and fuel oil filters are stored in glassed-in storage racks; car body filters are stored in open racks.

Steel parts are cleaned in approximately the same way except the rinse is by a hose. A similar general procedure is followed for aluminum parts except that the cleaning solution is Sprex A. C. Both tanks are served by a jib crane with a 15-ft. radius and a 1-ton hoist.

Radiators are cleaned, tested and stored in one corner of the room. They are cleaned by immersion in one tank containing cleaning solution and flushed out in a second in which the water is agitated by a pump. The leakage test is given on a stand at this same location. All handling is done with a 1-ton hoist.

Room for cleaning all types of filters



The disastrous results of another low-water case

Locomotive Inspection Report

The report of the Interstate Commerce Commission Bureau of Locomotive Inspection for the fiscal year ended June 30, 1951, recently released by Edward H. Davidson, director, reflects in many ways the rapid changeover from steam to diesel power. Reports were filed for 3,148 fewer steam locomotives and 3,608 more locomotives other than steam than for the previous year. While the number of inspections made of the decreasing total of steam units dropped by 6,696 the percentage found defective increased from 10.1 to 12.9 and the number ordered out of service also increased—from 399 to 508. The number of accidents in which steam power was involved decreased slightly and the number of persons killed doubled—from 7 to 14—and the number of persons injured totaled 170.

With respect to locomotives other than steam the increase in the number of inspections made over the previous year was 10,445, 8.3 per cent of those inspected were found defective and 106 were ordered out of service. This type of power was responsible for 54 accidents, the death of 2 persons and the injury of 129.

Steam Locomotives

One of the tables shows the various parts and appurtenances of steam locomotives and tenders which through failure have caused serious and fatal accidents in the past

TABLE 1—REPORTS AND INSPECTIONS

STEAM LOCOMOTIVES

	Year ended June 30— 1951	1950	1949	1948	1947	1946
Number of locomotives for which reports were filed	26,595	29,743	33,866	37,073	39,578	41,851
Number inspected	62,113	66,809	85,353	93,917	94,034	101,869
Number found defective	7,995	6,740	7,035	9,417	10,248	11,337
Percentage inspected found defective	12.9	10.1	8.2	10.0	10.9	11.1
Number ordered out of service	508	399	436	654	708	690
Number of defects found	34,657	28,504	28,642	38,855	41,250	56,541

LOCOMOTIVE UNITS OTHER THAN STEAM

	Year ended June 30— 1951	1950	1949	1948	1947	1946
Number of locomotive units for which reports were filed	19,320	15,719	12,692	9,803	7,805	6,616
Number inspected	52,948	42,503	30,684	20,798	13,115	10,908
Number found defective	4,375	2,748	1,238	853	633	499
Percentage inspected found defective	8.3	6.5	4.0	4.1	4.8	4.6
Number ordered out of service	106	42	20	21	19	17
Number of defects found	11,935	6,325	2,804	1,745	1,442	1,385

TABLE 2—ACCIDENTS CAUSED BY LOCOMOTIVE PARTS FAILURES

STEAM LOCOMOTIVES, INCLUDING BOILER, OR TENDER

	Year ended June 30— 1951	1950	1949	1948	1947	1946
Number of accidents	167	169	228	341	360	419
Percent increase or decrease from previous year	1.2	25.9	33.1	5.3	14.1	2.2[1]
Number of persons killed	14	7	10	15	16	10
Percent increase or decrease from previous year	100[1]	30.0	33.3	6.3	60.0[1]	50.0
Number of persons injured	170	184	243	361	464	439
Percent increase or decrease from previous year	7.6	24.3	32.7	22.2	5.7[1]	2.3[1]

STEAM LOCOMOTIVE BOILER[2]

	Year ended June 30— 1951	1950	1949	1948	1947	1946	1915	1912
Number of accidents	51	59	81	104	116	156	424	856
Number of persons killed	3	4	9	14	12	10	13	91
Number of persons injured	59	70	94	108	124	165	467	1,005

LOCOMOTIVE UNITS OTHER THAN STEAM, AND THEIR APPURTENANCES

	Year ended June 30— 1951	1950	1949	1948	1947	1946
Number of accidents	54	51	49	41	40	38
Number of persons killed	2	3	...	..	2	..
Number of persons injured	129	50	67	50	41	56

[1] Increase.
[2] The original act applied only to the locomotive boiler.

TABLE 3—ACCIDENTS AND CASUALTIES RESULTING FROM FAILURES OF LOCOMOTIVE PARTS

STEAM LOCOMOTIVES AND TENDERS AND THEIR APPURTENANCES

Part or appurtenance which caused accident	1951 Accidents	1951 Killed	1951 Injured	1950 Accidents	1950 Killed	1950 Injured	1949 Accidents	1949 Killed	1949 Injured	1948 Accidents	1948 Killed	1948 Injured	1947 Accidents	1947 Killed	1947 Injured
Air reservoirs										1		2	1		1
Aprons	1		1	2		2	3		3	5		5	4		4
Arch tubes	1		1	1		1									
Ashpan blowers							1		1						
Axles										3		3	1	2	1
Blow-off cocks	2		2	2		2	5	1	4	5		5	8		8
Boiler checks	3		3	3		3	4		5	7	1	6	7		7
Boiler explosions															
A. Shell explosions															
B. Crown sheet; low water; no contributory causes found	5	3	8	8	4	12	4	6	13	10	12	8	11	7	16
C. Crown sheet; low water; contributory causes or defects found	1		5	1		2	1	1	1	3		7	2	4	3
D. Miscellaneous firebox failures													2		4
Brakes and brake rigging	3	3	3	2		2	3		4	11		24	8		12
Couplers	2		2	4	1	4	3		4	4		4	6		6
Crank pins, collars, etc.	2	1	1	1		1				2		2	3		3
Crossheads and guides	1		1	1	1	2	1		1	1		1	2		2
Cylinder cocks and rigging										3		3	3		3
Cylinder heads and steam chests										1		1	2		2
Dome caps															
Draft appliances							3		3						
Draw gear	1		1	1		1							1		1
Fire doors, levers, etc.	2		2	2		2	3		3	10		10	2		2
Flues	3		3	6		9	3		3	8		9	4		4
Flue pockets															
Footboards	8		8	8		8	10		10	15		15	15		15
Gage cocks							1		1						
Grease cups				1		1							1		1
Grate shakers	7		7	6		6	11		11	15		15	20		20
Handholds	14		14	11		11	13	1	12	12		12	18		18
Headlights and brackets	1	1		1		1	1		1	3		3	2		2
Injectors and connections (not including injector steam pipes)	3		3	7		7	12		12	10		10	14		14
Injector steam pipes	1		1							4		5	4	1	4
Lubricators and connections	4		4	2		2	4		4	2		2	4		4
Lubricator glasses				1		1	1		1						
Patch bolts															
Pistons and piston rods										2		2	1		1
Plugs, arch tube and washout	2		2	1		1				3		3	1		1
Plugs in firebox sheets															
Reversing gear	5		5	9	1	8	6		6	12		12	13		13
Rivets							1		1						
Rods, main and side				1		2	2		2	5		7	3	1	2
Safety valves															
Sanders	1		1	4		4	4		4	4		4	5		5
Side Bearings							1		1						
Springs and spring rigging	2		2	3		3	1		1	4		4	3		77
Squirt hose	6		6	9		9	14		14	5		5	19		19
Staybolts	2		2	1		1				4		4	2		2
Steam piping and blowers	3		3	3		6	4	1	3	13	1	13	4		4
Steam valves	3		3	3		3	3		3	6		6	8		8
Studs				1		1	1		1				2		2
Superheater tubes	1		1	3		3	3		6	2		3	2		2
Throttle glands				2		2	3		4	1		1			
Throttle leaking	5		5	2		2	1		1	1		1	2		2
Throttle rigging	5		5	7		7	11		11	10		10	16		17
Trucks, leading, trailing, or tender	2		2				3		3				2		20
Valve gear, eccentrics, and rods	2		2				1		1	3		3	4		4
Water glasses	1		1	3		3	5		5	4		4	8		8
Water-glass fittings							3		4	3		3	3		3
Wheels	1		1							3	1	2			
Miscellaneous	61	6	59	46		49	74		75	121		122	117	1	117
Total	167	14	170	169	7	184	228	10	243	341	15	361	360	16	464

TABLE 4—NUMBER OF STEAM LOCOMOTIVES REPORTED, INSPECTED, FOUND DEFECTIVE, AND ORDERED OUT OF SERVICE—Continued

Parts defective, inoperative or missing, or in violation of the rules	1951	1950	1949	1948	1947	1946
42. Reversing gear	631	404	405	649	528	482
43. Rods, main and side, crank pins, and collars	1,511	1,213	1,408	1,998	2,136	2,581
44. Safety valves	45	34	45	45	70	72
45. Sanders	806	641	608	597	569	784
46. Springs and spring rigging	3,340	2,848	3,177	4,124	4,622	5,195
47. Squirt hose	90	74	63	93	79	120
48. Stay bolts	280	229	227	292	318	360
49. Stay bolts, broken	282	193	196	258	283	268
50. Steam pipes	312	302	256	435	356	551
51. Steam valves	181	131	133	150	146	203
52. Steps	805	680	652	767	778	914
53. Tanks and tank valves	1,304	1,205	1,228	1,757	1,558	1,570
54. Telltale holes	33	28	33	60	69	60
55. Throttle and throttle rigging	927	664	709	923	1,026	979
56. Trucks, engine and trailing	700	580	545	812	1,005	1,261
57. Trucks, tender	710	540	471	652	795	1,101
58. Valve motion	673	486	484	676	778	1,080
59. Washout plugs	325	289	268	384	441	740
60. Stokers	306	261	216	270	208	....
61. Water glasses, fittings, and shields	858	907	920	1,039	1,318	1,190
62. Wheels	536	394	455	779	583	840
63. Miscellaneous—Signal appliances, badge plates, brakes (hand)	774	652	626	707	870	1,337
Number of defects	34,657	28,504	28,642	38,855	41,250	56,541
Locomotives reported	26,595	29,743	33,866	37,073	39,578	41,851
Locomotives inspected	62,113	66,809	85,353	93,917	94,034	101,869
Locomotives defective	7,995	6,710	7,035	9,417	10,248	11,337
Percentage of inspected found defective	12.9	10.1	8.2	10.0	10.9	11.1
Locomotives ordered out of service	508	399	436	654	708	690

TABLE 5—NUMBER OF LOCOMOTIVE UNITS OTHER THAN STEAM REPORTED, INSPECTED, FOUND DEFECTIVE, AND ORDERED FROM SERVICE

Parts defective, inoperative or missing, or in violation of the rules	1951	1950	1949	1948	1947	1946
1. Air compressors	146	99	26	32	9	15
2. Axles, truck and driving	2	2	1	3	2	....
4. Batteries	85	20	13	8	1	2
5. Boilers	43	46	9	30	5	11
6. Brake equipment	1,166	673	299	204	178	102
8. Cabs and cab windows	672	377	159	90	97	46
9. Cab cards	100	75	46	37	29	24
10. Cab floors, aprons, and deck plates	1,281	726	234	134	130	72
11. Clutches	4	1	2	....	....	2
12. Controllers, relays, circuit breakers, magnet valves, and switch groups	166	61	35	24	14	16
13. Coupling and uncoupling devices	35	32	15	12	13	6
14. Current collecting apparatus	9	18	20	11	3	9
16. Draft gear	141	91	66	36	30	18
17. Draw gear	46	27	13	8	4	3
18. Driving boxes, shoes, and wedges	38	51	33	16	38	44
20. Frames or frame braces	27	9	5	2	7	10
22. Fuel system	1,082	483	191	136	66	57
23. Gages or fittings, air	70	29	11	11	10	7
24. Gages or fittings, steam	14	14	2	2	5	...
25. Gears and pinions	9	15	6	9	1	..
26. Handholds	97	70	53	32	22	18
28. Inspections and tests not made as required	143	116	90	59	78	357
29. Insulation and safety devices	64	48	36	10	11	12
30. Internal-combustion engine defects, parts and appurtenances	3,270	1,456	602	241	254	145
32. Jack shafts	5	8	11	5	3	4
33. Jumpers and cable connectors	190	86	8	7	1	8
35. Lateral motion, wheels	11	2	7	18	7	18
36. Lights, cab and classification	23	7	5	5	1	2
37. Lights, headlight	16	9	3	3	2	..
39. Meters, volt and ampere	14	7	....	3	3	4
40. Motors and generators	314	106	46	26	16	15
42. Pilots and pilot beams	36	29	16	23	15	8
43. Plugs and studs	3	....	....	....	....	....

TABLE 3—ACCIDENTS AND CASUALTIES RESULTING FROM FAILURES OF LOCOMOTIVE PARTS—Continued

LOCOMOTIVE UNITS OTHER THAN STEAM, AND THEIR APPURTENANCES

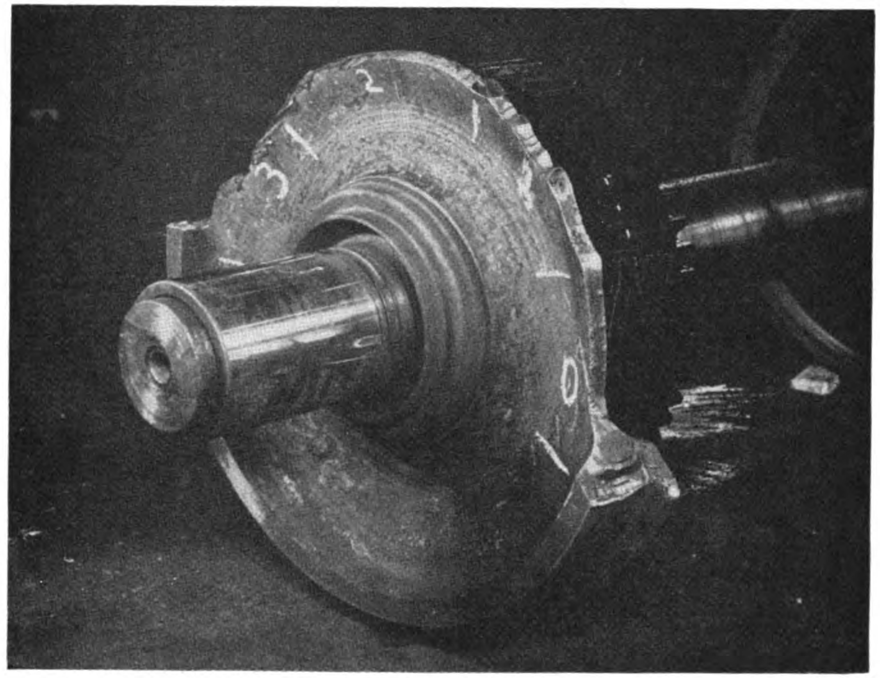
Part or appurtenance which caused accident	Year ended June 30— 1951			1950			1949			1948			1947		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Brakes and brake rigging	2		3	4	...	4	4	...	5	3	...	6	2	...	2
Carburetors	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Couplers	1	..	1	1	...	1	1	...	1	...	...	...	2	...	2
Crank pins and connecting rods	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Fires due to overflowing or leakage of fuel, crankcase explosions, back firing, etc.	9	...	10	4	...	4	8	...	9	3	...	3	7	...	8
Generators and starting devices	2	...	2	1	...	1	1	...	1	1	...	1	...	...	...
Insulation	1	...	1	...	...	...	1	...	1	...	...	...	4	1	5
Pantographs and trolleys	1	1	...	1	1	...	1	...	1	...	...	...	1	1	...
Short circuits	9	...	9	2	...	2	6	...	6	7	...	7	2	...	2
Miscellaneous	29	1	103	38	2	38	27	...	43	27	...	33	22	...	22
Total	54	2	129	51	3	50	49	...	67	41	...	50	40	2	41

TABLE 4—NUMBER OF STEAM LOCOMOTIVES REPORTED, INSPECTED, FOUND DEFECTIVE, AND ORDERED OUT OF SERVICE

Parts defective, inoperative or missing, or in violation of the rules	Year ended June 30— 1951	1950	1949	1948	1947	1946
1. Air compressors	897	719	693	1,007	944	1,044
2. Arch tubes	17	9	11	15	19	27
3. Ashpans and mechanism	64	59	52	72	87	93
4. Axles	4	1	4	8	6	7
5. Blow-off cocks	262	220	220	274	308	388
6. Boiler checks	477	386	337	424	428	526
7. Boiler shell	226	211	208	298	342	462
8. Brake equipment	2,453	1,845	1,806	2,617	2,512	2,992
9. Cabs, cab windows, and curtains	1,173	862	781	1,049	1,347	1,501
10. Cab aprons and decks	395	364	355	414	428	469
11. Cab cards	83	97	95	109	91	120
12. Coupling and uncoupling devices	54	41	42	55	58	46
13. Crossheads, guides, pistons, and piston rods	1,363	1,100	1,147	1,611	1,683	1,941
14. Crown bolts	52	53	46	78	98	88
15. Cylinders, saddles, and steam chests	1,437	1,160	1,155	1,617	2,004	2,217
16. Cylinder cocks and rigging	474	376	356	494	650	679
17. Domes and dome caps	131	90	82	142	130	164
18. Draft gear	441	368	370	461	449	536
19. Draw gear	297	280	300	413	453	462
20. Driving boxes, shoes, wedges, pedestals, and braces	1,145	1,037	1,070	1,582	1,580	1,922
21. Firebox sheets	203	181	191	302	257	333
22. Flues	184	152	156	201	197	253
23. Frames, tail pieces, and braces, locomotive	486	451	451	576	820	1,003
24. Frames, tender	47	34	39	72	63	88
25. Gages and gage fittings, air	173	116	118	185	135	185
26. Gages and gage fittings, steam	325	272	268	354	358	370
27. Gage cocks	495	386	375	474	404	495
28. Grate shakers and fire doors	339	326	286	455	444	555
29. Handholds	420	439	421	513	469	540
30. Injectors, inoperative	60	45	39	66	39	50
31. Injectors and connections	2,190	1,767	1,795	2,329	2,369	2,750
32. Inspections and tests not made as required	121	122	104	148	350	8,885
33. Lateral motion	465	389	507	821	791	862
34. Lights, cab and classification	118	60	58	132	155	161
35. Lights, headlight	108	131	118	183	143	168
36. Lubricators and shields	222	157	157	236	228	351
37. Mud rings	153	145	147	186	217	238
38. Packing nuts	638	558	474	456	575	691
39. Packing, piston rod and valve stem	765	510	511	658	691	776
40. Pilots and pilot beams	124	126	73	132	156	153
41. Plugs and studs	117	104	99	169	236	262

TABLE 5—NUMBER OF LOCOMOTIVE UNITS OTHER THAN STEAM REPORTED, INSPECTED, FOUND DEFECTIVE, AND ORDERED FROM SERVICE—Continued

Parts defective, inoperative or missing, or in violation of the rules	Year ended June 1951	1950	1949	1948	1947	1946
44. Quills	26	10	9	16	18	52
46. Rods, main, side, and drive shafts	2	6	1	5	6	11
48. Sanders	902	356	151	106	82	57
49. Springs and spring rigging, driving and truck	108	103	43	44	63	42
51. Stay bolts, broken or defective	....	1	....	....	....	..
53. Steam pipes	24	32	17	10	4	1
54. Steps, footboards, et cetera	377	284	213	116	68	29
55. Switches, hand-operated, and fuses	15	9	1	3	1	..
56. Transformers, resistors, and rheostats	9	9	2	6	2	3
57. Trucks	234	182	84	65	45	52
59. Water tanks	33	20	2	1	2	1
60. Water glasses, fittings, and shields	11	27	2	18	....	15
61. Warning signal appliances	83	21	9	7	8	2
62. Wheels	215	95	98	72	48	54
63. Miscellaneous	574	377	109	39	40	31
Number of defects	11,935	6,325	2,804	1,745	1,442	1,385
Locomotive units reported	19,320	15,719	12,692	9,803	7,805	6,616
Locomotive units inspected	52,948	42,503	30,684	20,798	13,115	10,908
Locomotive units defective	4,375	2,748	1,238	853	633	499
Percentage of inspected found defective	8.3	6.5	4.0	4.1	4.8	4.6
Locomotive units ordered out of service	106	42	20	21	19	17



A driving wheel which failed under a diesel-electric passenger locomotive while the train was running at a speed of 62 m.p.h.

five years. If the information contained in this table is taken advantage of and proper inspections and repairs made in accordance with the requirements of the law and rules many accidents will be avoided.

During the year, 13 per cent of the steam locomotives inspected by the inspectors were found with defects or errors in inspection that should have been corrected before the locomotives were put into use; this is an increase of three per cent from the results of the preceding year. Five hundred and eight locomotives were ordered withheld from service because of the presence of defects that rendered the locomotives immediately unsafe.

Six boiler explosions occurred in the fiscal year; all were caused by overheating of the crown sheets due to low water. Three persons were killed in these accidents and 13 were injured. There was a decrease of three in the number of boiler explosions and a decrease of one each in the number of persons killed and injured compared with the preceding year.

Four of the explosions occurred on locomotives in freight-train service, one on a locomotive in switching service, and one on a locomotive in charge of a watchman. One of the locomotives used in freight service was equipped with a low water alarm which was badly damaged by the explosion that caused the death of the engineer and fireman. Evidence could not be developed to show whether or not the alarm functioned prior to the accident. The top water glass connection was defective on another locomotive and caused a false high indication of water level in the boiler which deceived the engine crew; resulted in an overheated crown sheet and subsequent explosion. Absence of a safe water level was known to employees on two of the locomotives prior to the explosions.

Forty-five boiler and appurtenance accidents other than explosions resulted in injuries to 46 persons. This is a decrease of 5 accidents and a decrease of 10 injuries compared with the preceding year.

Eight hundred and eighteen applications were filed for extension of time for removal of flues, as provided in Rule 10. Investigations disclosed that in 57 of these cases the condition of the locomotives or other circumstances were such that extensions could not properly be granted. Nine were in such condition that the full extension requested could not be authorized, but extensions for shorter periods of time were allowed. Thirty extensions were granted after defects disclosed by investigations were required to be repaired. Twenty-one applications were canceled for various reasons. Seven hundred and one applications were granted for the full period requested.

Locomotives Other Than Steam

Fifty-four accidents, resulting in 2 deaths and injuries to 129 persons, occurred in connection with locomotive units propelled by power other than steam. This represents an increase of 3 in the number of accidents, a decrease of 1 in number of persons killed and an increase of 79 in the number of injured compared with the preceding year.

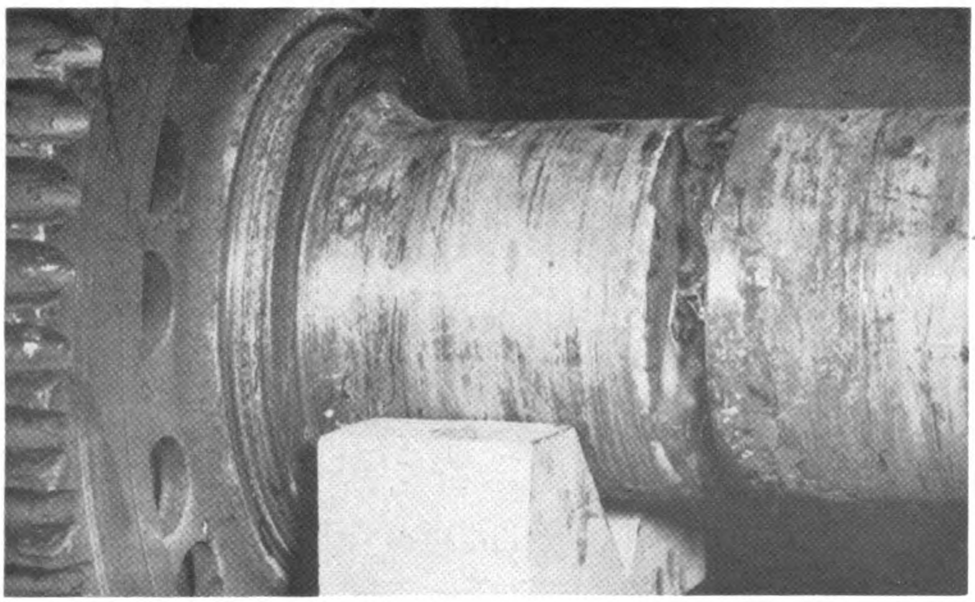
During the year, 8.3 per cent of the locomotive units inspected by inspectors were found with defects or errors in inspection that should have been corrected before the units were put into use; this represents an increase of 1.8 per cent compared with the results obtained in the preceding year. One hundred and six locomotive units were ordered withheld from service by inspectors because of the presence of defects that rendered the units immediately unsafe; this represents an increase of 64 units compared with the preceding year.

Specification Cards and Alteration Reports

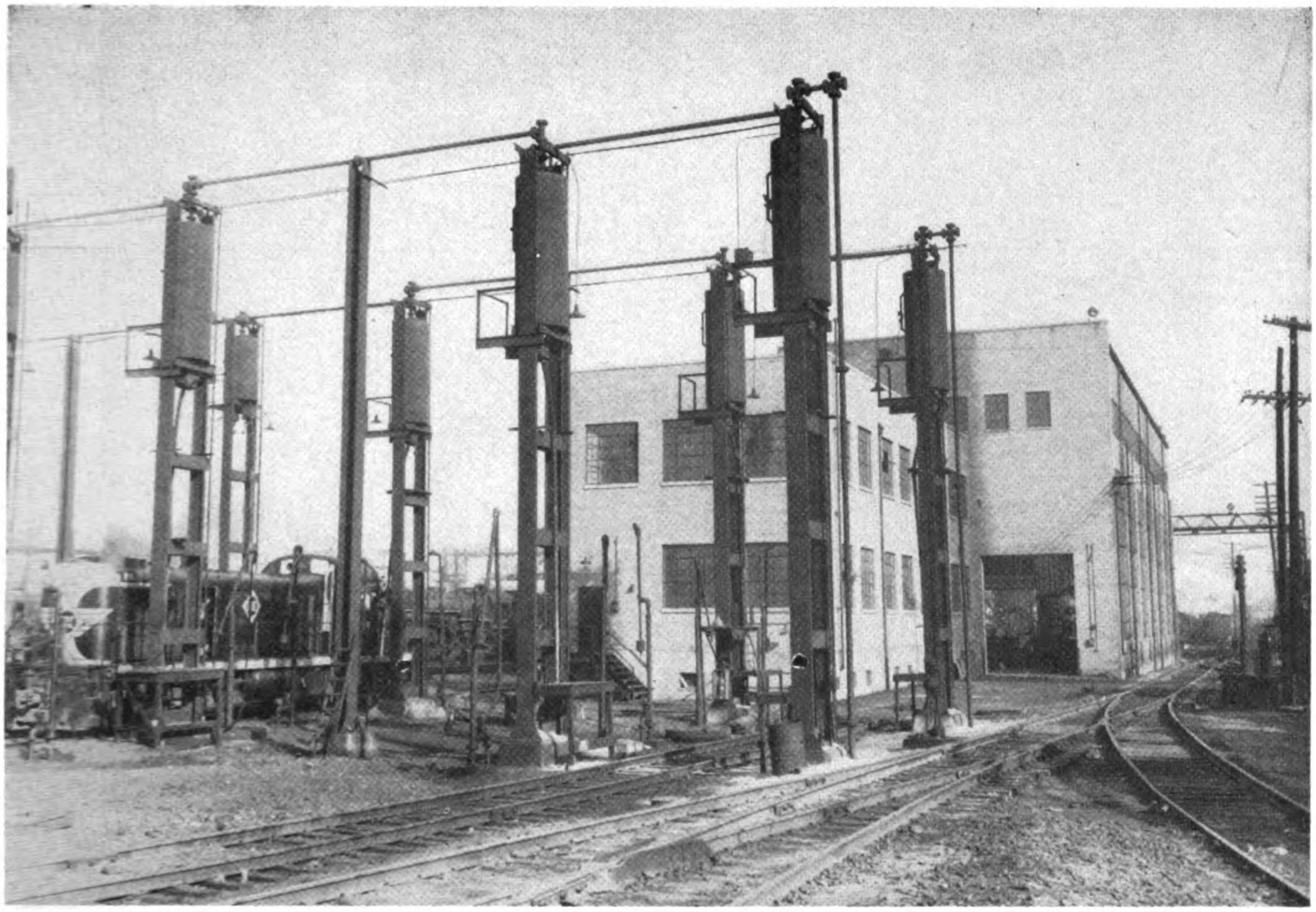
Under Rule 54 of the Rules and Instructions for Inspection and Testing of Steam Locomotives, 117 specification cards and 3,072 alteration reports were filed, checked, and analyzed. These reports are necessary in order to determine whether or not the boilers represented were son constructed or repaired as to render safe and proper service and whether the stresses were within the allowed limits. Corrective measures were taken with respect to numerous discrepancies found.

Under Rules 328 and 329 of the Rules and Instructions for Inspection and Testing of Locomotives Other Than Steam, 3,828 specifications and 716 alteration reports were filed for locomotive units and 692 specifications and 271 alteration reports were filed for boilers mounted on locomotive units other than steam. These were checked and analyzed and corrective measures taken with respect to discrepancies found.

No formal appeal by any carrier was taken from the decisions of any inspector during the year.



Driving axle from a diesel-electric passenger locomotive which failed because of a progressive fracture caused by overheating due to a lack of lubrication



Sanding and fueling facilities outside the shop building. The old enginehouse, for steam locomotives, is at the right and the terminal yard tracks are in the background.

Erie Maintains Suburban Power in New Shop at Jersey City

EVERY week-day the Erie handles thousands of commuters from the suburban areas of New Jersey and New York State into Jersey City, N. J., where they go, by various routes—ferry and underground—to New York City. To do this requires the operation of 163 commuter trains and the use of 86 locomotives. At Jersey City there is a new, partially completed shop to care for the 37 diesel-electric locomotives assigned to the district. There are still 49 steam locomotives which help handle this service that are serviced and maintained in the adjacent enginehouse and shop. The 37 diesels not only handle suburban trains in the rush hours but operate on local freights and do switching service during the remainder of the 24 hours.

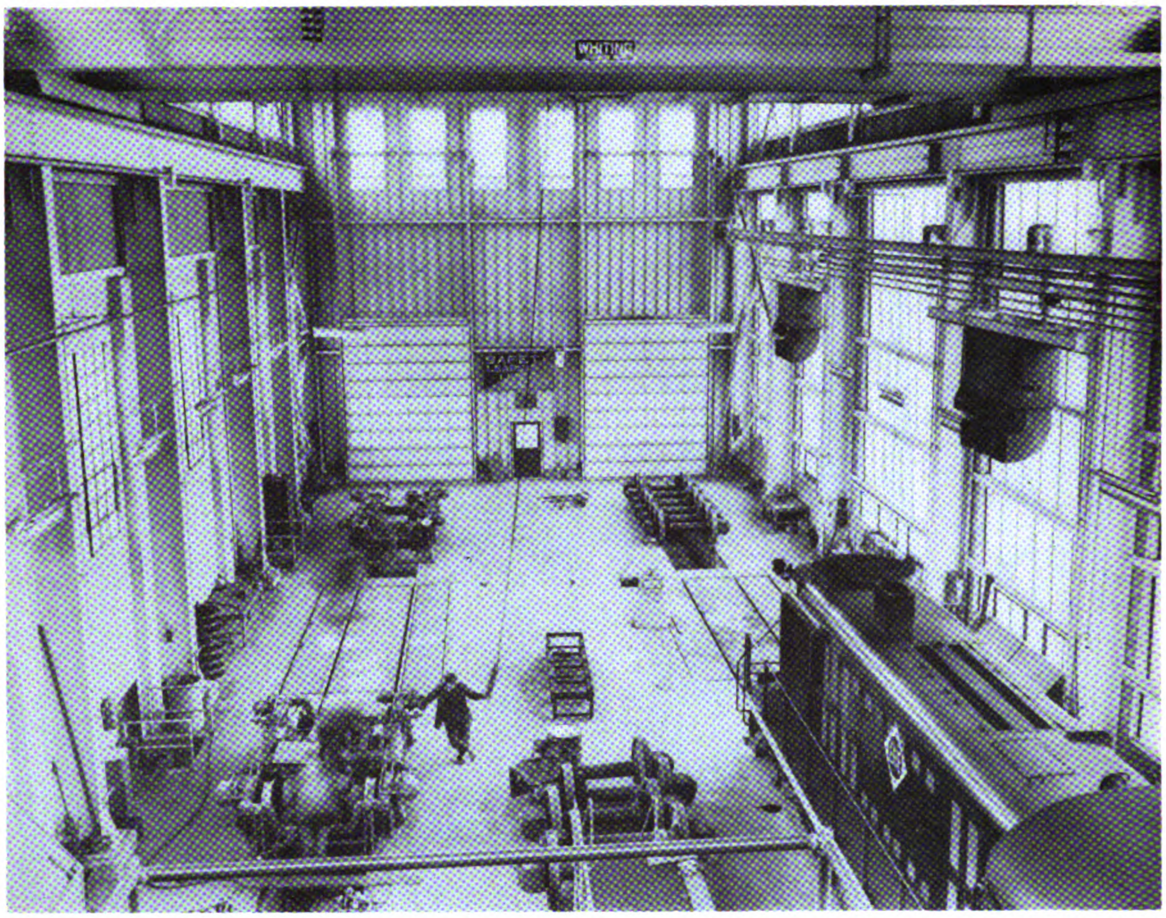
The new facilities include the shop, sandhouse and fuel storage tanks. The new buildings are adjacent to the enginehouse.

The shop is equipped and staffed so that all types of repairs can be made. Most of the work at present consists of periodic inspections necessary on the diesels that work out of the terminal.

The work includes cleaning and repair of engine parts, air brakes, cylinders and heads, grinding of valves, overhauling of trucks, including wheel changes, repair of steam generators and inspection of electrical equipment. Thirty-seven units work out of the terminal at present, and these undergo regular inspections and progressive maintenance.

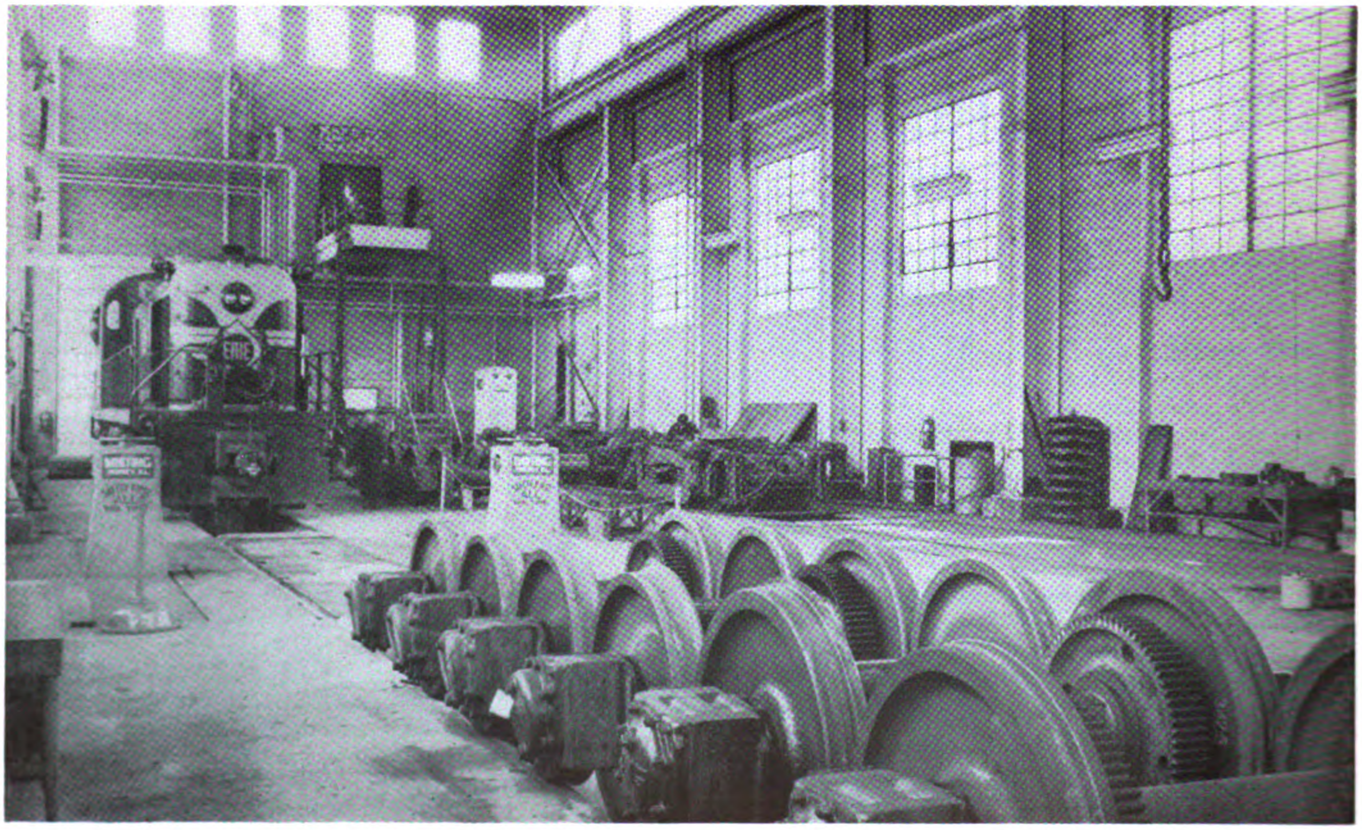
The main shop equipment includes a 30-ton Whiting overhead crane, Whiting drop table, Ajadip cleaning tank, vapor degreaser, Universal valve and tool grinders and other necessary apparatus. Two one-ton traveling electric cranes are located in the adjacent parts repair room.

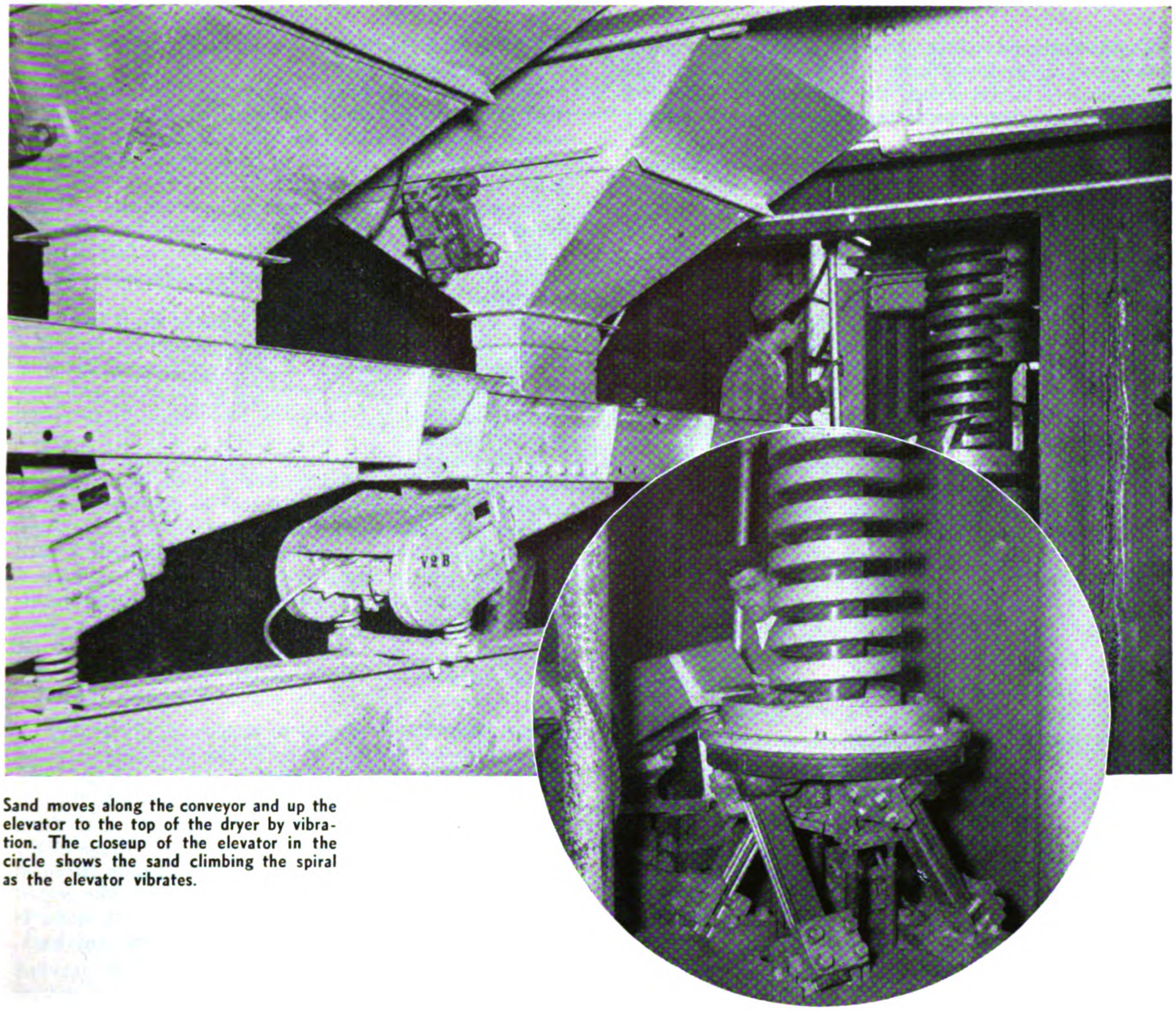
A temporary storeroom is located on the second floor of the west end of the shop. When the entire shop is completed this storeroom will be used for other purposes.



The interior of the Erie's new diesel shop at Jersey City as seen from the balcony. The high ceiling assures plenty of headroom for handling locomotive parts as well as the maximum in ventilation

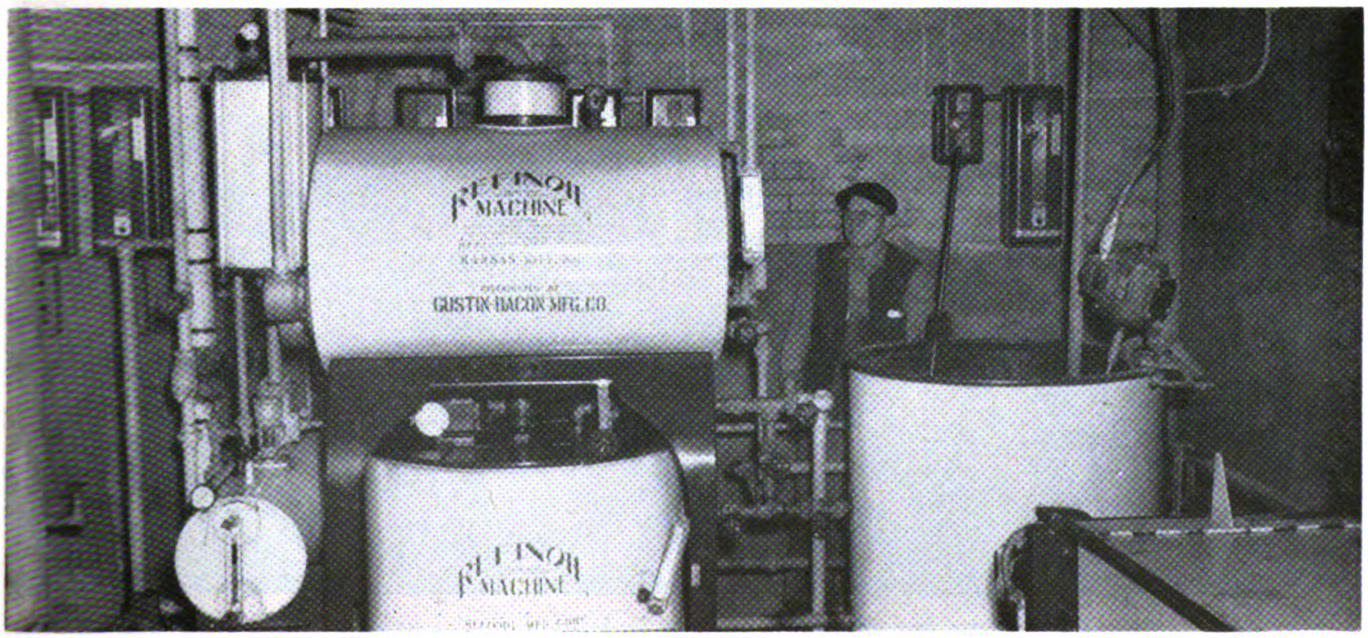
On the track in the foreground is the Whiting drop table. On the other shop track truck work is performed.





Sand moves along the conveyor and up the elevator to the top of the dryer by vibration. The closeup of the elevator in the circle shows the sand climbing the spiral as the elevator vibrates.

The equipment in the oil reclamation room in the basement of the Erie shop



On the north side of the present structure is an outdoor inspection pit and platform. Well-lighted with overhead and work-level lights, the pits and platform are used for inspection, repairs and for changing or adding lubricating oil or water.

Off the outdoor pits in the basement is an oil reclamation room. The room includes three 8,000-gallon capacity tanks, one for "scavenger" oil, one for new oil for blending with the reclaimed oil and one for mixing the reclaimed and new oil. Approximately 150 gallons of used oil can be reclaimed each eight-hour working day.

A new fuel oil pumping station includes two 6,800-gallon fuel storage tanks. The station also includes automatic unloading devices which eliminate manual handling.

The Syntron sandhouse equipment is one of the interesting points of the new layout. It operates by "magic" and electric eyes. The sand is moved by vibration into the drier. Switches for storage tanks and movement of the sand over the conveyor and elevator are turned off and on by the electric eyes.

As a bystander you watch the sand flowing swiftly over a conveyor which has no moving parts, *up* an elevator which has no moving parts and then through the drier and screens into indoor storage bins from where the sand is blown out into outdoor storage tanks.

The conveyors and elevator, which is constructed like a circular iron stairs, vibrates, and the sand moves forward and upward.

The electric eyes guard the storage bins. When the sand reaches the watch-eye's level, a switch is thrown and no more sand enters the bin. Conversely, when the sand level is low in the bins or tanks, the eyes throw the switch to start the processing.

The unprocessed sand arrives in box-cars and is transferred into the processing plant's hoppers by crane.

The ceiling of the main shop is high to facilitate removal of diesel power plants and to insure maximum ventilation.

The shop is heated by overhead forced draft fan units. Plenty of light for ideal working conditions is furnished by fluorescent and mercury vapor light fixtures. Exhaust fans in the ceiling along the length of the high roof draw off gas and exhaust fumes. The building is of steel and brick construction.

In the basement is a locker and washroom. This includes showers, wash fountains and toilet facilities. An electric water cooler also is located in the basement.

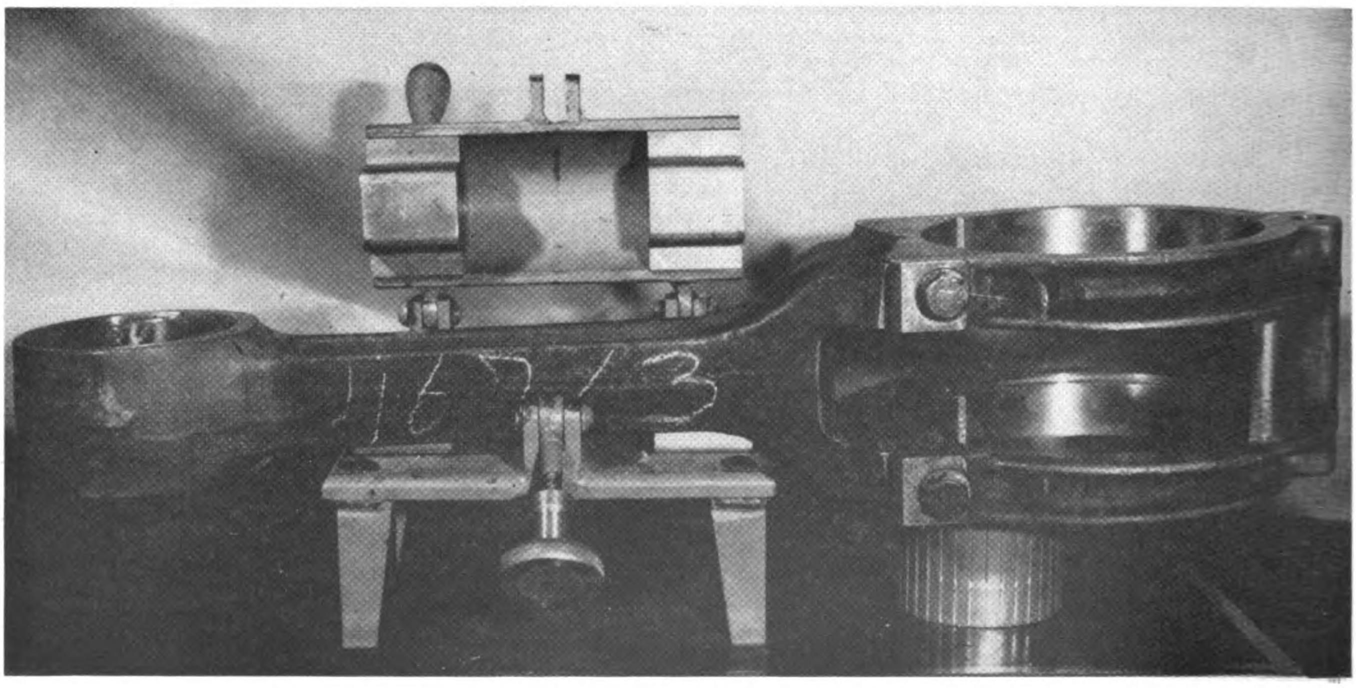
When the additions to the present building are completed, the present ash pits will be eliminated. Yard tracks also will be straightened out for direct movement from the shops into the station tracks. The engine dispatcher's tower will be eliminated.

Connecting Rod Form Vise

A special form vise built at the Chattanooga, Tenn., shops of the Southern quickly and securely clamps diesel engine connecting rods. The principal uses of the vise are to hold connecting rods for tightening the basket bolts and for making the diameter of the gasket.

The vise is 6 in. wide and 9½ in. long. The rod rests on two filler blocks shaped to mate with the groove in the I-section of the rod. The blocks are made of brass to protect the connecting rods from damage and are mounted with the tops 5¼ in. above the bench.

The top, or clamping portion, of the vise is made from a length of 4-in. flue. Two blocks similar in shape to the bottom blocks are milled out to suit the inside curve of the flue and mate with the top of the rod. The top is supported on two hinges which are fitted with stops to prevent the top of the vise from falling all the way back. A small hand wheel clamps the top over the rod.



The vise clamps the rod securely for tightening the basket bolts with a torque wrench.

QUESTIONS AND ANSWERS

Diesel-Electric Locomotives*

Fuel Injection Pump

376-Q.—What is the function of the fuel injection pump? A.—The fuel injection pump has three jobs to do. (1) Build up high pressure to the injection nozzle; (2) Meter the amount of fuel to the injection nozzle; (3) Deliver fuel at a predetermined time to the nozzle.

377-Q.—How is the high pressure built up? A.—The high pressure is bulit up by a constant stroke pump plunger.

378-Q.—Explain how this is accomplished? A.—Oil flows from the low pressure header into a sump in the upper part of the pump housing. As soon as the upper edge of the plunger, during its downward stroke, opens the two radial opposite ports on the barrel known as the inlet and by-pass ports, the fuel flows into the barrel while the plunger is at the bottom of its stroke.

379-Q.—What happens during the first part of the upward stroke of the plunger? A.—Some of the fuel in the barrel is forced back into the sump through the inlet and by-pass ports until these ports are closed by the double helix cut in the plunger.

380-Q.—What happens after the ports are closed? A.—The plunger then builds up high pressure within the barrel, unseats the delivery valve and forces oil through the high pressure pipe to the injection nozzle.

381-Q.—Where is the delivery valve located? A.—The delivery valve and seat is located on top of the fuel injection pump housing and is held in place by a large holding nut and gasket.

382-Q.—What must be done if a leak occurs around the delivery valve holder? A.—Apply a new gasket or anneal the old one.

383-Q.—Is there a gasket between the face of the delivery valve and the plunger barrel? A.—No this is a ground joint and should be carefully guarded against damage if taken out.

384-Q.—What does the amount of fuel delivered to the nozzle depend on? A.—The amount of fuel delivered to the nozzle depends upon the lift required for the helix to open the by-pass port.

385-Q.—How is this controlled? A.—By the fuel pump rack which moves in and out, timing the plunger through a control sleeve so as to give an earlier or later port opening.

386-Q.—What is the most outstanding factor contributing to the satisfactory operation of the injection pump? A.—The proper filtration of fuel oil handled by pump.

387-Q.—How does dirty oil affect the operation? A.—It causes untimely wear and destruction of the pump plungers and delivery valves and seriously affects the operation of the engine. It is, therefore, necessary to protect the injection pump by cleaning the filters periodically.

388-Q.—How is termination of the fuel delivery varied? A.—Termination of the delivery, which also controls the quantity delivered per stroke is varied by turning the plunger in the barrel through the control rod.

389-Q.—Why does turning the plunger accomplish this result? A.—The helix is brought into various positions with relation to the by-pass port.

390-Q.—Explain the movement of the control rod to reduce the fuel delivery per stroke. A.—The less the control rod is moved away from its *stop* position and the less the plunger is thereby turned in its barrel, the sooner the helix opens the by-pass port and the smaller the delivery of fuel per stroke.

391-Q.—What is the movement to increase the fuel delivery? A.—The further the control rod is moved away from its *stop* position and the further the plunger is turned in its barrel, the later the helix opens the by-pass port and the larger the fuel delivery per stroke will be.

392-Q.—Can a fuel injection pump be cut out? A.—Yes. a cut-out latch is provided for each fuel injection pump.

393-Q.—How is this accomplished? A.—Push in the pump rack and flip the latch over, to prevent movement of the spring loaded operating lever. In this position the pump will not deliver fuel.

394-Q.—How many pumps may be cut out at any one time? A.—No more than two pumps may be cut out at any one time in order to prevent abnormal action of the governor.

Fuel Injection Nozzles

395-Q.—Where are the fuel injection nozzles located and what is their function? A.—They are located in the cylinder heads and their function is to admit fuel into the combustion space.

396-Q.—What should the condition of the fuel be when entering the combustion space? A.—The fuel must be admitted to the combustion space in a finely atomized condition and the spray distributed so that each particle will come in contact with sufficient oxygen for complete combustion.

397-Q.—Describe in detail how the oil travels through the nozzle. A.—Oil is fed to the nozzle from the fuel injection pump through tubing to the fuel inlet connection at the top of the nozzle holder body and down a drilled passage in this body which connects with a machined groove on top of the nozzle. Drilled passages lead from this groove to the under side of the nozzle valve.

398-Q.—What happens as the fuel pressure builds up? A.—As the fuel pressure from the pump builds up, the valve in the nozzle is raised from its seat and injection of fuel begins. When the pressure, timed from the cam under the pump, drops below the pressure at which the spring has been set, the valve returns to its seat.

399-Q.—How is leakage past the valve taken care of? A.—Any leakage finds its way into the nozzle holder and is drained through a pipe connecting the nozzle drain to the fuel tank.

* This series of questions and answers relate specifically to the Alco-G.E. Diesel electric locomotives.

400-Q.—Why is a small amount of leakage desirable?
A.—This is a means of lubricating the valve in its fit in the nozzle body.

Schedule 24 RL
Air Brakes

Operation of Independent Application and Release Portion

1253-Q.—From what three sources does the control pipe 16 receive its air to operate the relay valve?

A.—The independent brake valve, D-24 control valve and the straight air pipe.

1254-Q.—What functions to select the proper passage through the control valve?

A.—The double check valves in the independent application and release portion.

1255-Q.—What harm may result from leakage through these double check valves?

A.—Brakes may fail to release.

1256-Q.—How can this be prevented?

A.—By making certain that the non-operating ends of the double check valves are open to the atmosphere.

1257-Q.—Give an example, when operating the automatic brake.

A.—When operating the automatic brake, the straight air pipe *8* and the independent application and release pipe *20* must be open.

1258-Q.—Give an example when operating the independent brake.

A.—When operating the independent brake, the straight air pipe *8* and the displacement volume must be open.

1259-Q.—How is the displacement volume connected to atmosphere?

A.—Through the release slide valve and exhaust port *10* in release position.

Recommended Inspection When Units Are Assembled

1260-Q.—What first should be noted?

A.—The position of the *K2* and *K2*-A rotair valve handles should be noted on each "A" unit and the controlled emergency cocks on the "B" units, seeing that they are positioned properly.

1261-Q.—How should the control be for all passenger and short freight trains?

A.—The control should be in *PASS* position for all passenger and short freight trains.

1262-Q.—What should be considered when FRGT position is selected?

A.—The class of the freight train with reference to speed should be considered.

1263-Q.—Give an example of the above.

A.—For example, a heavy freight train of 50 cars or more, operating at top speeds of 30 to 35 m.p.h., should be placed in *FRGT* position, but trains operating at higher speeds would not be placed in *FRGT* position until train length exceeded about 70 cars.

1264-Q.—Will the above apply to overspeed, safety, train control, split reduction and timing reservoir?

A.—Yes, automatically.

1265-Q.—What should be observed on the B unit?

A.—The *B* unit hostler's valve supply and the *NS-1* reducing valve brake pipe supply cocks must be closed. The hostler's brake valve handle should be removed.

1266-Q.—What should be done with the brake pipe cut-out cock?

A.—The brake pipe cut-out cock must be closed on all automatic brake valves except the lead or controlling unit.

1267-Q.—What should the position of cut-out cock handle be when closed?

A.—It should be in a vertical position.

1268-Q.—What should be done with the cocks and hose?

A.—Connect all hose and open all end cocks between units.

1269-Q.—What test should be made after coupling and conecting all units?

A.—Note that brakes apply and release on all units from the lead or controlling *independent brake valve.*

1270-Q.—What should be done next?

A.—After charging the brake pipe about six minutes, D-24 control valve branch pipe cut-out cock open and charging and change-over cock in *FRGT* position or about three minutes in *PASS* charging position, make a 15 lb. brake pipe reduction and lap the brake valve.

1271-Q.—What should be observed at this time?

A.—Note the brake pipe gage for one minute for leakage which should not exceed five pounds.

1272-Q.—What other gage should be observed?

A.—Brake cylinder gage. Brakes should apply and remain applied for the above one minute period.

1273-Q.—What test should follow?

A.—Close the brake pipe cut-out cock, move brake valve handle to emergency position, observing that the brake valve emergency exhaust valve opens and brake pipe indicates zero on the gage. Check all units that brakes are applied.

1274-Q.—What check should follow?

A.—Open the brake pipe cut-out cock and place brake valve handle in running position. Check all units that brakes have released.

1275-Q.—When the electro-magnetic brake is used what check must be made?

A.—Move the shifter lever to S.A. position, brake valve handle in running position. Move the brake valve handle to full application position and note the pressure on the straight air pipe gage.

1276-Q.—What should be the maximum pressure shown on the gage?

A.—The maximum pressure as shown on the gage should be 70 to 75 lb.

1277-Q.—How much time is required to obtain this pressure?

A.—The time should not be more than five seconds to obtain up to five pounds below maximum pressure.

1278-Q.—What would Pumping Action on the gage indicate?

A.—It would indicate leakage.

1279-Q.—What will the resulting brake cylinder pressure depend upon?

A.—It will depend upon the type of relay valve used and may only be a ratio of that in the straight air pipe.

1280-Q.—What attention should be given the graduated release cap on the control valve?

A.—It should be noted that the cap is in its proper position.

1281-Q.—When should the cap be changed if a change is necessary?

A.—The graduated release cap can be changed without draining the reservoirs when the D-24 control valve is in release position.

1282-Q.—What inspection should the engineman make of cocks on which a seal is attached?

A.—The engineman should inspect the seal on all sealed cocks to determine if they are properly sealed, and should report any on which the seal is broken.

1283-Q.—What are the instructions relative to rotair valves and controlled emergency cocks?

A.—The rotair valves and controlled emergency cocks, depending upon specific railroad instructions, may be positioned for *FRGT* after locomotives are attached to the train and returned to *PASS* position when detached from the train.

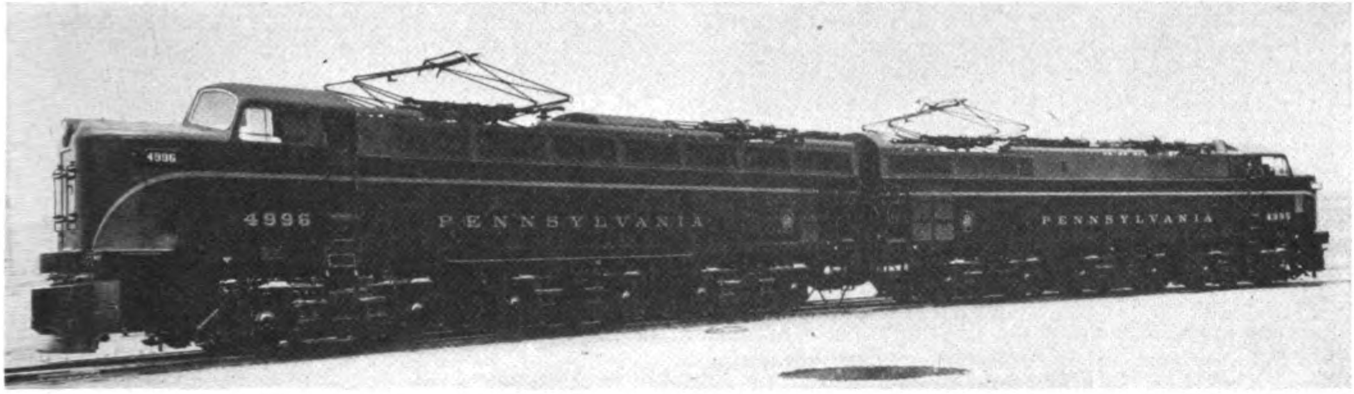


Fig. 1—Type 2(B-B-B), 6,000-hp., 11,000-volt, 25-cycle, Ignitron locomotive

Rectifier Locomotives in Pennsylvania Freight Service*

Four units built by Westinghouse employ Ignitron rectifiers to convert 25-cycle a.c. power to d.c. power for driving standard diesel traction motors

By C. C. Whittaker and W. M. Hutchinson †

RECENT developments of the Ignitron rectifier in the industrial and power fields have revived interest in using it for railyway work. Extensive tests in the laboratory and on an experimental railway car have demonstrated that a locomotive using Ignitron rectifiers offers promise in combining the best features of the a.c. and d.c. electrification systems. Two 6,000-hp. Ignitron rectifier electric freight locomotives recently placed in service by the Pennsylvania mark a significant innovation in the development of railroad motive power.

It has long been recognized that the low-voltage, direct-current, series-wound motor is well suited for traction purposes. It has advantages over a.c. traction motors of relative simplicity in construction of the ability to develop higher starting torques without exceeding limitations of commutation or heating. On the other hand, the single-phase a.c. system, as adopted by the Pennsylvania, results in economies in transmission and distribution systems, both in first and operating costs.

Development of Ignitron Motive Power

For a long time, the mercury-arc rectifier for converting alternating-current into direct-current has offered an opportunity to combine the advantages of the two systems. As early as 1914, a mobile rectifier was applied to a 25-cycle, 11,000-volt multiple-unit car operating on the New Haven. It was removed from service after 22,000 miles of operation because the rectifiers of that day had not been developed to the point where they were practical for such an application. They were of the multi-anode, pumped type, and with the seals then available, difficulty was experienced in maintaining the vacuum. There were also frequent arc-backs. With the advent of World War I, the idea was temporarily shelved.

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* Abstract of a paper presented at the Winter General Meeting of the American Institute of Electrical Engineers, held in New York, January 21-25, 1952.

† Both of Westinghouse Electric Corporation, East Pittsburgh, Pa.

In the 1920's, an alternate solution was developed in the form of the motor-generator locomotive. Such a locomotive converts high-voltage, a.c. power, collected from the trolley to low-voltage d.c. by a locomotive-mounted a.c. transformer and synchronous-motor, d.c. generator set. A number of such locomotives have been built and have proven to be successful in the low-speed, heavy-drag service for which they are particularly adapted. However, such locomotives are necessarily heavy and expensive.

TABLE I—TONNAGE RATINGS FOR A TYPICAL RULING GRADE—12-AXLE LOCOMOTIVES

	Trailing Tons	M.P.H.
Rectifier	4,600	40
A.C. motor	4,700	40
Diesel	2,700	40
Rectifier	14,000	17
A.C. motor	9,000	17
Diesel	8,300	17

It was the refinement of the Ignitron type of rectifier in 1932, followed by its extensive application during World War II in the production of aluminum and magnesium, which turned attention again to the possibilities of a rectifier locomotive.

The Ignitron locomotives have several outstanding advantages:

1. They are applicable to the a.c. trolley system with its high-voltage power supply.
2. They provide the same flexibility of control as the conventional a.c. locomotive, a control unequalled for a wide range of sustained horsepower output.
3. They secure the high sustained tractive force of d.c. traction motors.

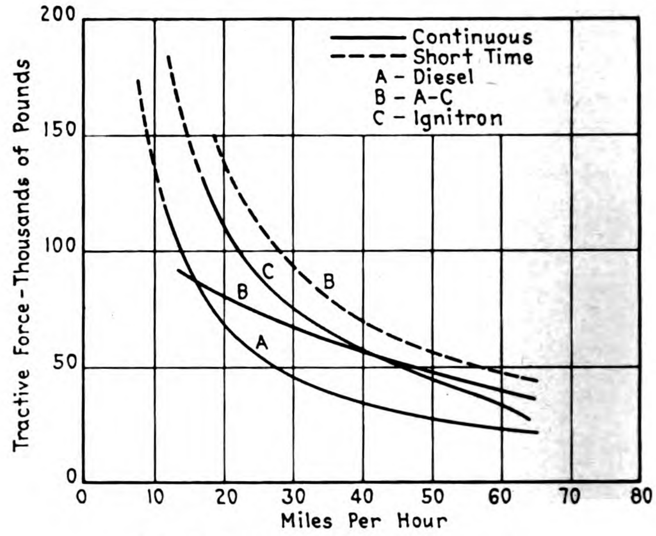


Fig. 2—Locomotive performance curves

4. They incorporate apparatus which is currently produced in large quantity.

Performance

Figure 2 illustrates the performance of the Ignitron locomotive in terms of tractive force and speed in comparison with a standard three-unit, 4,500-hp., (3,700 rail hp.), diesel-electric locomotive in widespread use today, and a two-unit, 5,625-hp., 25-cycle a.c. locomotive. Each of these locomotives has 12 axles with a

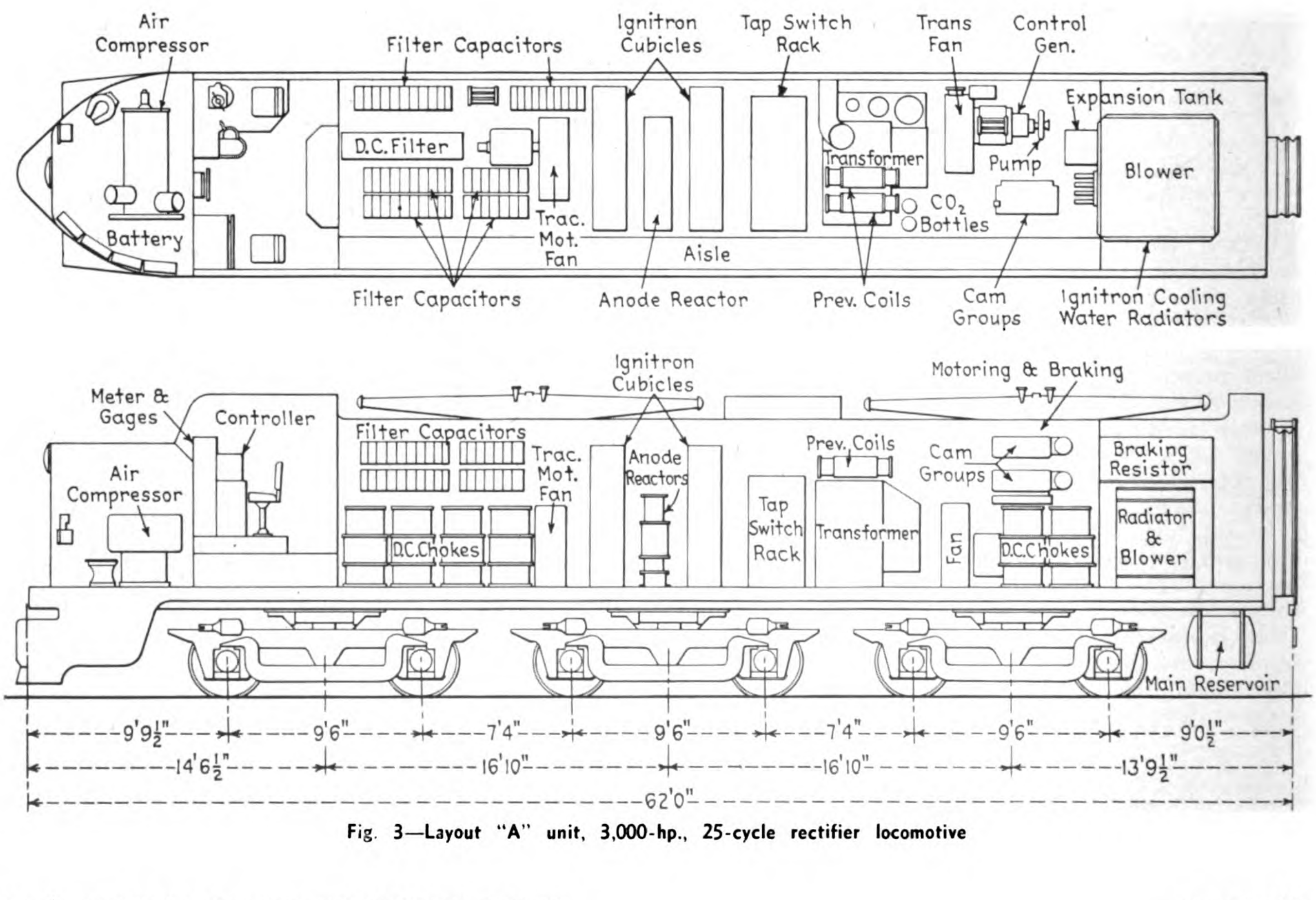


Fig. 3—Layout "A" unit, 3,000-hp., 25-cycle rectifier locomotive

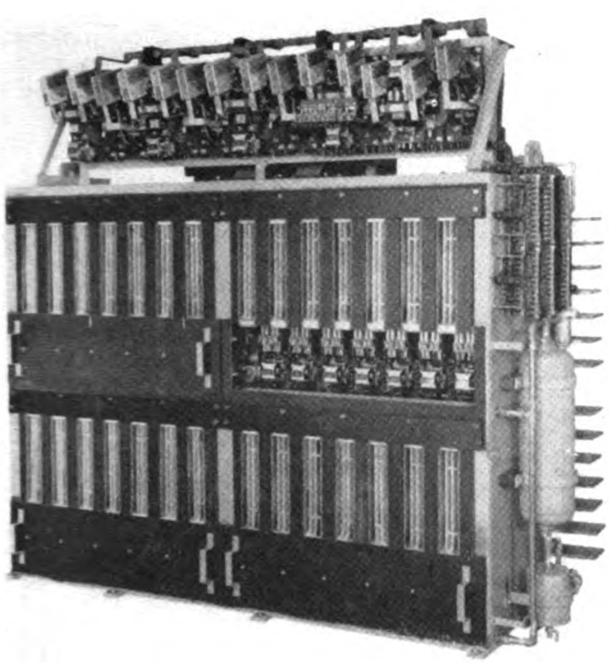


Fig. 4—Front view of tap switch rack

Fig. 5—Ignitron cubicle

TABLE II—PRINCIPAL DATA

Wheel arrangement	2 (B-B-B)	2 (C-C)
Line voltage a.c.	11,000	11,000
Phase	single	single
Frequency	25	25
Number of driving axles	12	12
Weight—total, lb.	751,000	728,000
Weight on drivers, lb.	751,000	728,000
Weight per driving axle, lb.	62,500	60,666
Continuous rating at rail,		
Tractive force, lb.	132,000	132,000
Speed—m.p.h.	17	17
Adhesion—per cent	17.6	18.1
Starting Tractive Force, lb.		
25 per cent adhesion	187,750	182,000
Maximum operating speed, m.p.h.	63	63
Number of traction motors	12	12
Driving wheel diameter	44 in.	44 in.
Gear ratio	15:68	15:68
Air brake equipment	Type 8-EL with D-24 brake valve	
Number of compressors	2	2
Compressor air displacement—		
Total cu. ft. per min	444	444
Type of control	Battery-electro-pneumatic	
Minimum curvature—Coupled to train	16 deg.	16 deg.
Minimum curvature—Locomotive only	21 deg.	18 deg. 30 in.
Length overall—between knuckles	124 ft	124 ft.
Total wheel base	104 ft. 5 in.	104 ft. 5 in.
Rigid wheel base	9 ft. 6 in.	16 ft. 10 in.
Width overall	10 ft. 1½ in.	10 ft. 1½ in.
Height over pantograph locked down	15 ft.	15 ft.
Height over cab	14 ft. 7⅜ in.	14 ft. 7⅜ in.
Width over cab	9 ft. 10 in.	9 ft. 10 in.
Track gage	4 ft. 8½ in.	4 ft. 8½ in.
Coupler height	34 in.	34 in.
Clearance over rail—new wheels	5¼ in.	5¼ in.

traction motor on every axle. The motors on the diesel locomotive are the same as those used on the Ignitron locomotive. The a.c. motors are the most modern of the resistance lead type. The mechanical features of the a.c. motor locomotives are identical with the Ignitron locomotives.

These curves illustrate the fundamental differences in performance of three locomotive types and point up the advantages of the Ignitron rectifier type. It will be noted that the rectifier locomotive develops about 60 per cent more tractive force than the diesel-electric locomotive over the entire speed range. The a.c. locomotive has an advantage over both the rectifier and diesel-electric locomotive in the high-speed range, as shown, but it will also be noted that in the low speed range, it is the weakest. The rectifier locomotive produces continuously almost 50 per cent more tractive force in the low-speed zone.

The advantage of the a.c locomotive in producing a short-time overload far in excess of its continuous rating is indicated. Actually, it is also possible to design for an equivalent overload with the rectifier system. However, there is no need for the added capacity since the continuous rating gives adequate performance in the low-speed range. The diesel-electric locomotive has a constant horsepower output, limited by the capacity of the diesel engine.

The information presented in these tractive force curves can be translated into ability to pull trains. Table I shows tonnages that can be hauled by the three types of locomotives under comparison. These are based on a typical railroad division. The speeds shown occur on the ruling grade.

One of these locomotives is equipped with two-axle trucks and the other with three-axle trucks, the purpose being to determine by service tests which type of truck will be the more suitable.

Ignitron Rectifier

In these locomotives, the Ignitron rectifier and its associated apparatus are made use of to convert energy received from an 11,000-volt, 25-cycle alternating-current trolley wire to direct-current for the operation of conventional d.c. traction motors.

The rectifier is a mercury arc device which employs an ignitor to initiate the arc at each positive half cycle, and to permit the arc to extinguish at each negative half cycle.

Transformer

The transformer is inerteen-insulated and cooled by means of an air-blown radiator. Its design is esssentially the same as that of a conventional a.c. locomotive transformer except that the secondary has a center tap with accelerating taps on both sides of the center. Since only

one-half of the secondary is used for each half cycle, the secondary winding is approximately 45 per cent larger than it would be for a single-phase series motor design. The inerteen is circulated by means of a pump built into the transformer tank. This transformer primary rates 4,200 kva. at 11,000 volts. The tank is "form fit" to minimize the volume of inerteen required.

Control Scheme:—Motoring

The transformer secondary is provided with a mid-tap (d.c. return), and a series of accelerating taps on each side of the mid-tap. These taps feed anode busses through preventive coils. Each anode bus feeds an Ignitron tube through an anode circuit breaker and anode reactor. These two tubes supply full-wave rectified d.c. to a single traction motor. From each individual motor, the circuit continues through a d.c. choke reactor, which limits the ripple to approximately 30 per cent, a motor switch, and a cutout switch back to the mid-tap.

All six traction motors per *A* unit are similarly connected in parallel relation, in which connection slipping and spinning of drivers is minimized. In motoring there are 35 notches.

Phase delay of ignition to the tubes is made use of to increase the number of notches with a given number of transformer taps. This delay is varied up to 30 deg. in motoring and 50 deg. in braking.

The tap switch rack, Fig. 4, is entirely enclosed in a cubicle, when in operation except for the arc box openings. It is ventilated by approximately 3,000 cu. ft. per min. of air, which is expelled through the arc boxes. The contactors on the top of the box are starting and running contactors for the auxiliary motors and include a heater contactor.

The traction motors are type 370-DZ, each rated 500 hp. These motors have six main and commutating poles. Both armatures and field windings are silicone-insulated. Roller bearings are used on the armature shaft and sleeve bearings on the axles. These motors are the same as are used on Baldwin-Westinghouse and Fairbanks-Morse diesel road locomotives.

Auxiliaries and Ventilation

There are but three blower motors on each *A* unit. The traction motor blower ventilates the traction motors and supplies air for the windshield defrosters. It is a 1,450-r.p.m. induction motor, driving a No. 4½ B Buffalo Forge Niagara Conoidal runner requiring 43 hp.

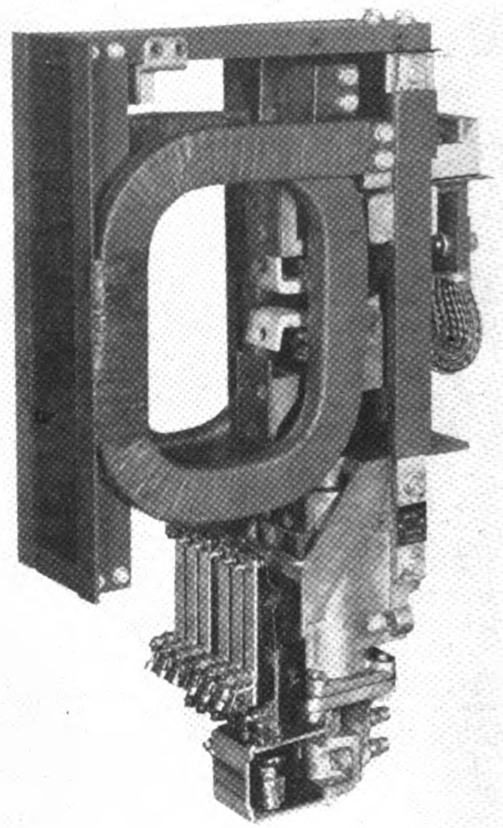


Fig. 6 (above)—Anode circuit breaker, arc box removed

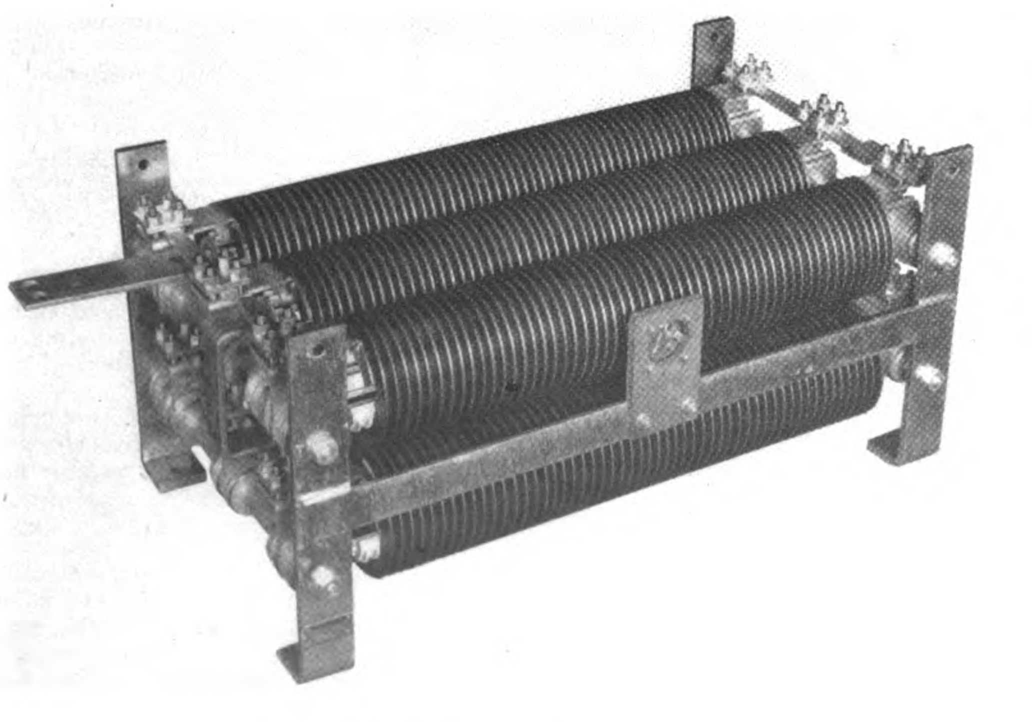


Fig. 7 (left)—Dynamic brake resistor for one traction motor armature

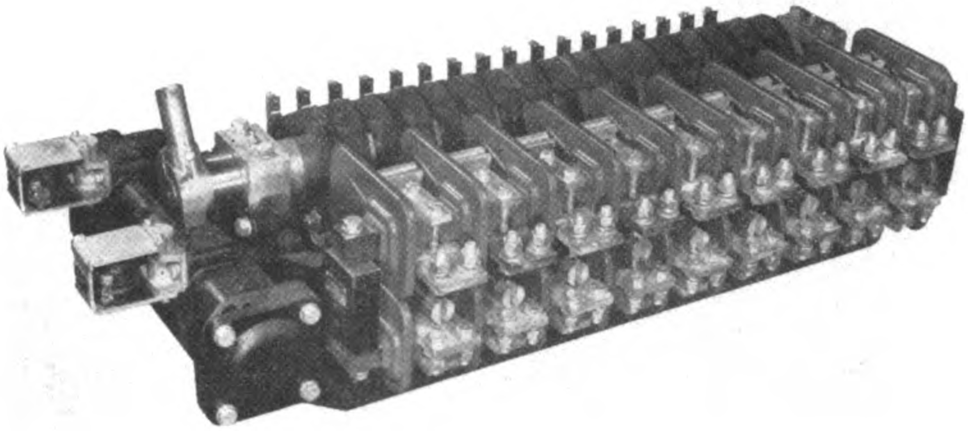


Fig. 8 — Cam switch change-over group for motoring and braking

Ventilating air is carried through a duct in the underframe which feeds air into each two-axle truck through the center pin and from the bolster to each motor.

On the locomotive using three-axle trucks, air is fed to each motor by means of a sliding "high-hat" arrangement on the underside of the duct directly to the motors.

The transformer blower is driven by an m.g. set. The motor of this set, which is rated 29 hp., 1,450 r.p.m., also drives the control generator, a 45-volt, 60-amp. machine and a centrifugal pump which circulates the cooling water for the Ignitron tubes. This blower ventilates the transformer radiator, the tap switch group, the d.c. chokes, and the motor reactors.

The radiators in the cooling system for the Ignitron tubes are ventilated by an induction blower motor rated 35 hp., 1,450 r.p.m. This motor drives an axiflow fan and draws air through the radiators and then passes the same air through the dynamic brake resistors mounted directly over the fan. The air is expelled through the roof. When dynamic braking is used, shutters are opened by a pneumatic cylinder to by-pass the radiators.

Ignitron Cubicles

There are two Ignitron cubicles per locomotive unit. Each Ignitron tube is mounted by a resilient structure which holds the tube at approximately its center of gravity. The mounting structure itself is fastened to insulating bolts, thus leaving the cathodes insulated from ground. These tubes are standard except for some special mercury baffling. At the upper left are seen three firing circuit controls, and at the upper right, there are six anode breakers. Each breaker must be capable of opening an arc-back on an Ignitron tube.

The most common trouble that has been associated with Ignitron tubes in stationary service has been with arc-backs. An arc-back occurs when a cathode spot forms on the anode and a short circuit results. In a multi-phase installation, the other phases feed power into this short and the result may be a current flow of 50,000 amp. or more. It is also possible for a d.c. load having stored energy in a shunt field to feed power back into the short.

While using single-phase for the railway application, no heavy arc-backs have been experienced in several years of testing in our laboratories and two years' operation of the experimental m.u. car. If an arc-back occurs, it is immediately extinguished at the next zero point on the voltage wave, and being a single-phase circuit, there is no other voltage present to re-ignite the arc independent of the ignitor itself. Since the load is composed of d.c. series motors, there is no possibility of reverse power from this source.

Protective apparatus is provided to short the ignitor circuit and open the anode breaker magnet valve circuit when an overload occurs. This results in the overload current being interrupted within the Ignitron tube because the overload trip operates in one-half cycle, and the anode breaker takes one and one-half cycles to open. Therefore, after an overload operation, the anode breaker opens without an arc. This anode breaker shown in Fig. 7, with arc box removed is a new design rated 1,200 amp., a.c. or d.c. It makes use of die cast parts instead of sand castings. It has air-core blowout coils. These have proved especially effective on d.c. because of no residual flux and on either a.c. or d.c. have the feature of forcing the arc to the center of the arc box instead of burning arc box sides. The front of the coils is braced against magnetic forces and vibration by the arc chute guide.

Control Scheme:—Braking

When the dynamic brake feature is used, the traction motor fields are excited by using two Ignitron tubes to provide d.c. These two tubes then feed all motor fields in series through a stepped resistor and then through one of the d.c. chokes back to the mid-tap on the transformer.

Connected across each motor armature and commutating field is a braking resistor of fixed value. Fourteen notches in braking are obtained by the use of two taps on each side of the midpoint of the transformer secondary, by varying a series resistor, and by utilizing phase delay on the two Ignitron tubes.

Air Compressors and Air Brake

The air brake is a combination of the 8-EL type with a DS-24 brake valve. The compressor is a Westinghouse Air Brake Company type 3-CD driven by an induction motor. During the starting period, the compressor is unloaded and pumps against pressure only after it is up to speed. At 750 r.p.m., each compressor supplies 222 cu. ft. per min. displacement.

Carbon dioxide protection against fire is provided by four 50 lb. tanks of CO_2. The apparatus compartment in each A unit has a six-ft. fire wall adjacent to the aisle to retain the gas when expelled around the electrical equipment. Several discharge nozzles are located at stra-

tegic points. The blowers are shut down by the discharge of CO_2. While the transformer blower is slowing down, the reactors ventilated by this blower are filled with CO_2. The traction motor blower has its intake shut off completely when the CO_2 is discharged. Gas may be discharged at either side of the locomotive inside the cab or at either side of the locomotive from the ground level.

If a fire is not extinguished by the gas in the unit where the fire occurs, the gas from the other unit may be used by opening a cock at the rear end of the unit not in trouble.

In addition to the above, there are portable CO_2 extinguishers. At the time this article was written, the first of these two locomotives was undergoing tests preliminary to road acceptance tests by the railroad. These tests indicated that the locomotive had ample margin in both motoring and braking performance. The value of the feature of having all motors in parallel was demonstrated on one test when, because of oil on the tread of the lightest-loaded axle, this axle continued to slip and balanced at a speed of 20 m.p.h., while the locomotive was running at 16 m.p.h. Consequently, no slip relays have been provided.

In order to meet a satisfactory delivery date on these two Ignitron locomotives and at the same time do some research work as to a.c. and d.c. filter requirements, it was thought best to build and equip the locomotives with the maximum size of filters that was thought might be required. Then, at a later date, after tests had been made in service, any excess filter capacity would be removed. This decision resulted in a somewhat crowded layout. Our tests to date indicate that we can remove the d.c. filter and approximately one-half of the a.c. filter. This will result in more accessibility and will remove approximately 11,000 lb. of capacitors and reactors.

Conclusion

Because these locomotives are just going into service, no operating results are yet available. Continued operation is expected to demonstrate the advantages of this type of locomotive on existing single-phase a.c. systems.

Its application is not limited, however, to 25-cycle operation, but it is equally adaptable to frequencies of 50 or 60 cycles. The principle deterrent to railroad electrification in this country is its high first cost. The ability of a rectifier locomotive to operate at commercial frequencies, as compared to a frequency of 25 cycles, necessitated by the limitations of a.c. motor design, offers the possibility of reducing electrification costs and widening the field in which it is economically justified.

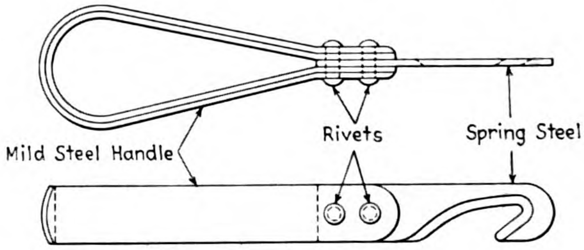
The two locomotives which have been placed in service by the Pennsylvania are therefore of interest, not only because of their advantages as a new type of motive power in this particular application, but also in the potentialities they have for the extension of electrification in the future.

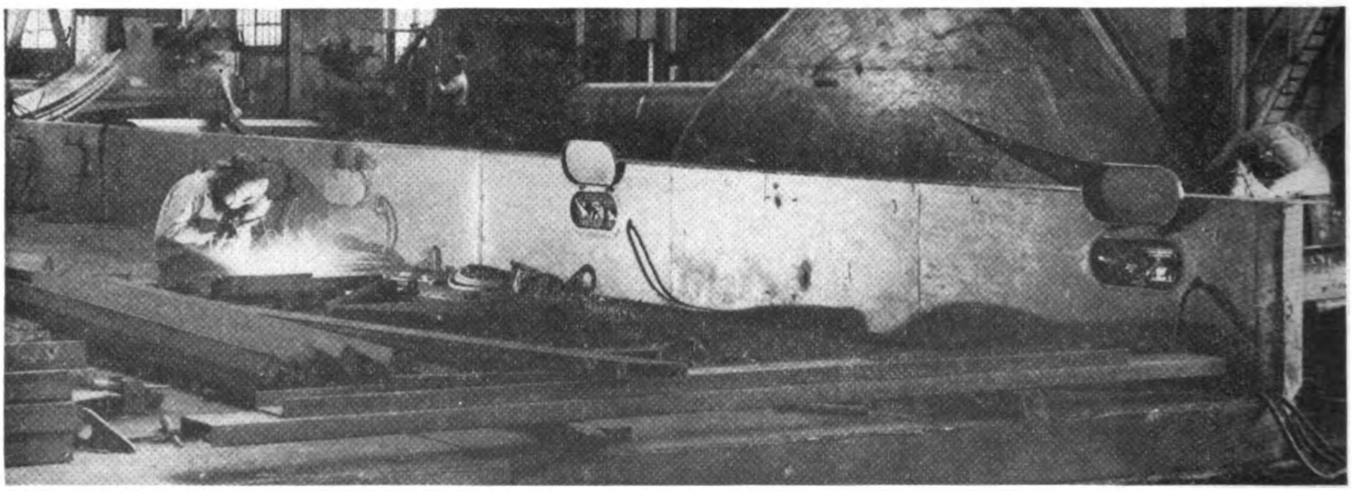
Wire Stripper

By Michael Axler

There are various types of wire strippers on the market, but a large amount of the stripping is done in locations where no such machine is available. Various methods are used. Some pound the wire with a hammer, and since the insulation is weaker than the wire, it cracks. Then the broken insulation may be peeled off with a knife. Some use a knife without pounding, but in either case, the wire may be nicked so that it will break later on.

In our shops we have a special stripper which is shown in the illustration. It is made of a piece of spring steel, or hack saw blade, a piece of flat steel and two rivets. The hook-shaped cutter is bevelled to an edge as shown. With this tool, it is easy to do a good stripping job without damaging the wire.





Center-Shop Position for Welders.—The picture shows the manner in which the Chicago Bridge and Iron Company has mounted welding machines on a special protective rack, located in the center of the shop. The machines are available from both sides, and only half of the usual amount of welding cable is required to reach from one wall across the shop to the other. The machines are protected by a cross plate on the top of the rack, and the controls are protected by hinged hatches. The installation includes a total of 16 General Electric arc welders arranged in batteries of eight

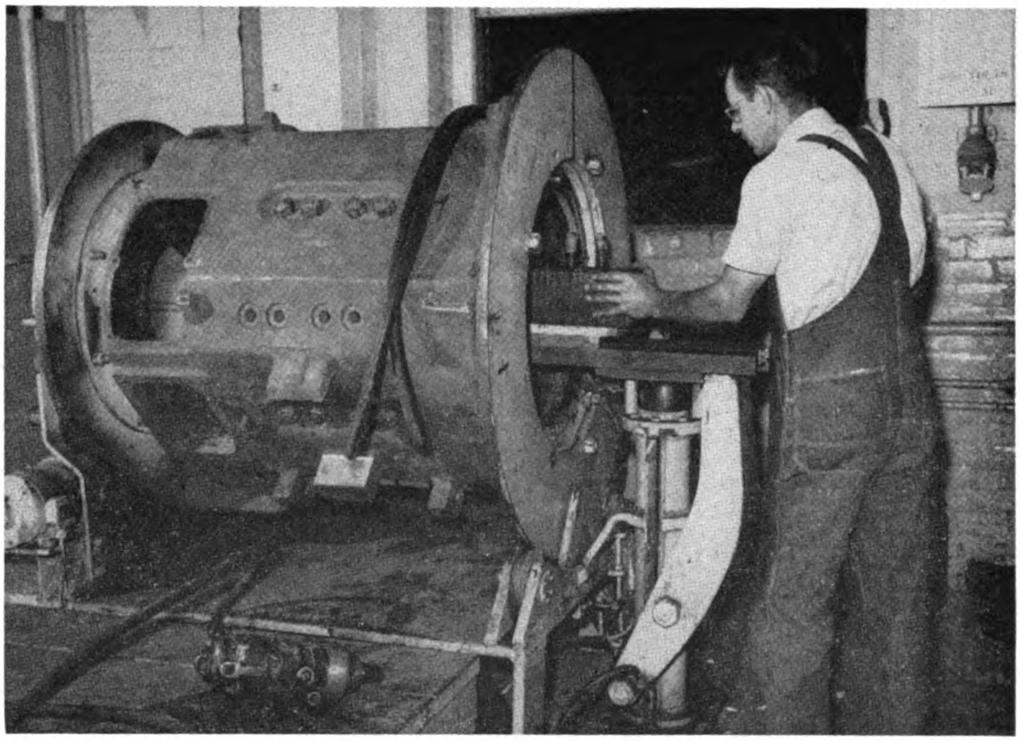


Fig. 1 — Motor-driven frame positioner as used to place an interpole and coil

Diesel-Electric Shop Equipment

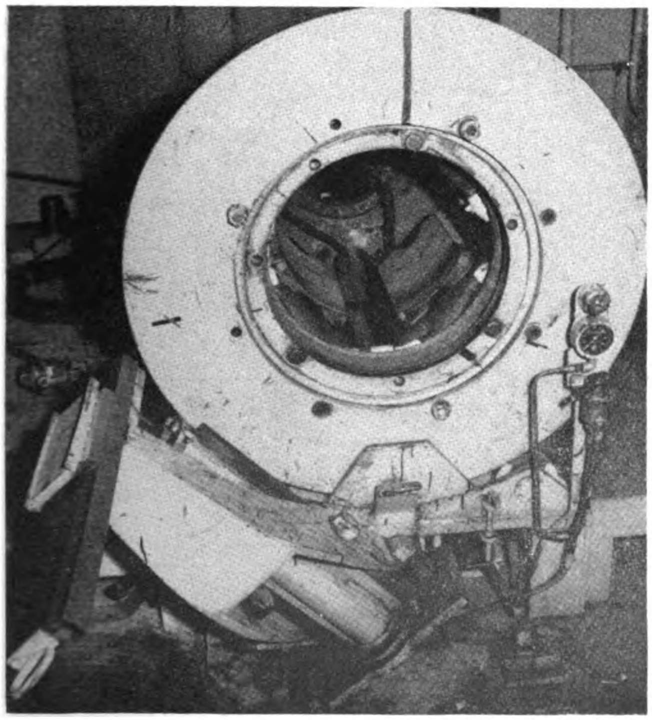


Fig. 2—Front view of positioner showing drive-motor switch and air cylinder control valve

Some Union Pacific contributions to better maintenance of traction motors and generators

THE Union Pacific recently revised the layout of its diesel electrical repair shop in Omaha, Nebraska, and in the process, developed a number of pieces of equipment and methods of procedure that are important contributions to improved maintenance. A few of the devices are shown in the illustrations.

Frame Positioner

The motor-drven frame positioner shown in Figs. 1, 2 and 3 is used for nearly all the work that is done on traction motor frames. When a frame is to be placed in the positioner, circular flanges are first bolted to each end of the frame. It is then picked up with a crane, and placed on the rollers of the positioner, as shown in the illustrations.

The motor shown in the lower left-hand corner of Figs. 1 and 3 is controlled from the operator's position, and is used to turn the frame in either direction to any de-

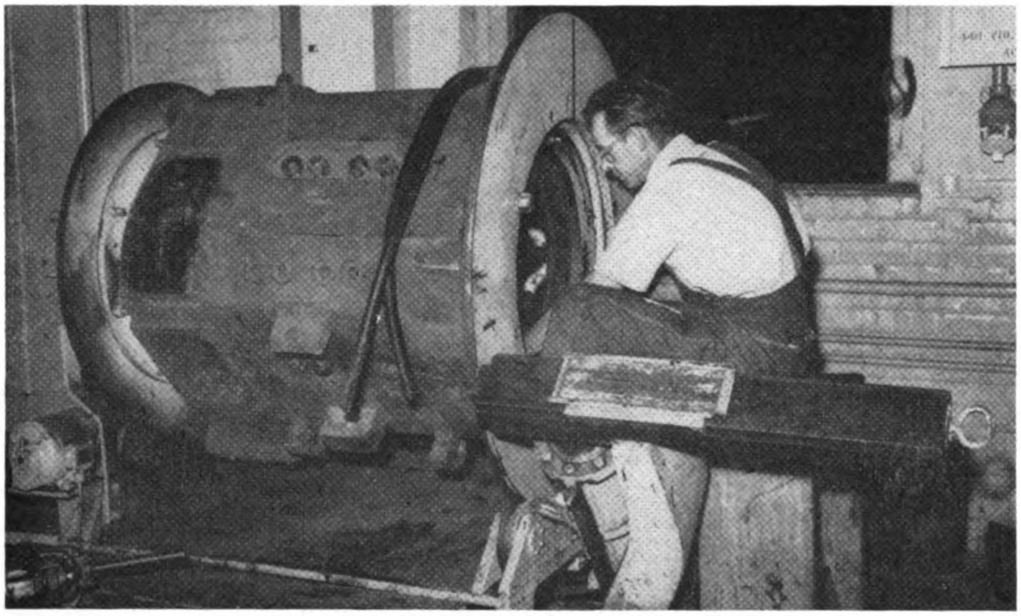


Fig. 3—Positioner with lifter swung aside to permit working inside frame

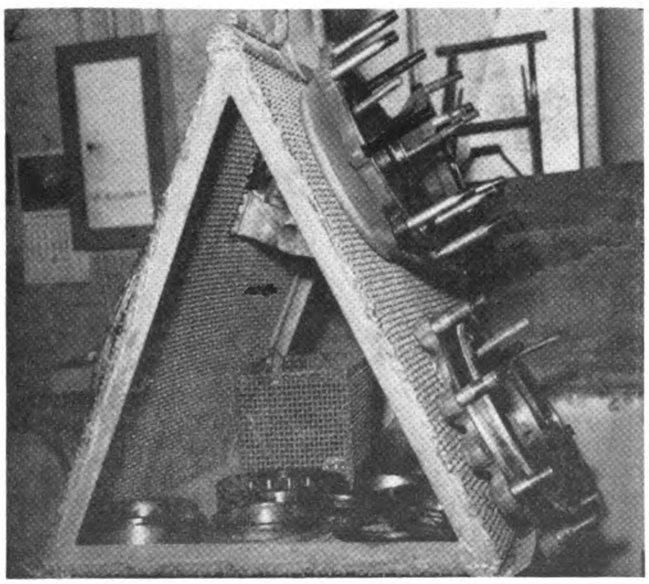
sired position. The switch for operating the motor is shown at the right in Fig. 2. The usual procedure is to turn the frame by hand and secure it in any position by means of a pin inserted through a fixed member and through one of a number of holes in the supporting flange. The motor drive is much faster and since it is positive, no locking pins are required.

In front of the positioner is an air-operated device for removing and replacing coils. It is shown in Fig. 1, as it is used for replacing a reconditioned interpole and coil. The pole and coil are placed on the horizontal member and pushed in the required distance. The vertical air cylinder is then used to lift the pole piece to position and hold it until the frame bolts are applied. When it is not in use, it is swung to one side as shown in Figs. 2 and 3. The air valve for operating the lifter is shown below the motor switch at the right of Fig. 2.

Parts Basket

Triangular baskets for cleaning small parts of motors in the vapor degreaser are shown in Figs 4 and 5. They are made of steel angles and cinder screen and are of welded construction. The screen facilitates mounting of assorted shapes and allows the dissolved grease and dirt to drain off easily. Parts cleaned in the baskets include bearings, pinion-end bearing housings, flinger rings and collars and traction motor covers. The small rectangular basket, also made of cinder screen, is for cleaning the cap screws used to apply pinion-end and commutator-end housings.

The procedure consists of loading the baskets with parts, lowering them into the degreaser as shown in Fig. 5, and allowing them to remain in the vapor until condensation stops. They are then flushed with liquid solvent and removed, and inspected with dial gages. Serviceable



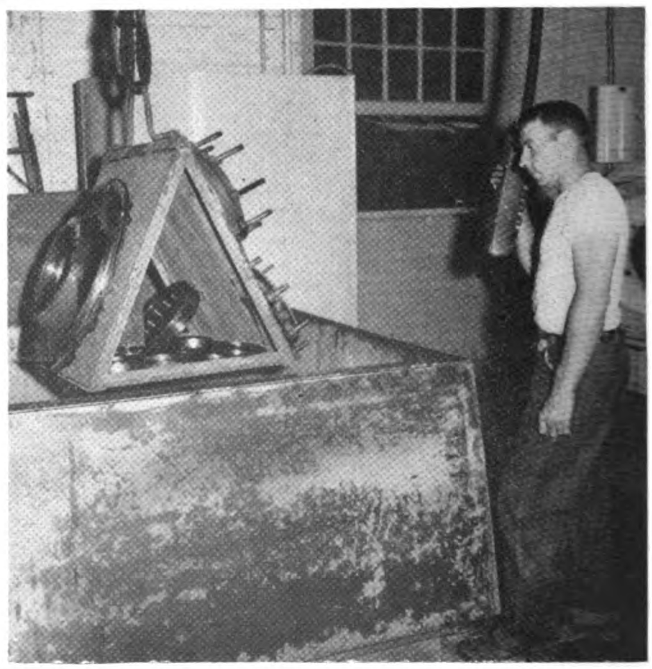


Fig. 4 (above)—Parts cleaning basket loaded with traction motor small parts. Fig. 5 (right)—The basket with parts in place being lowered into the degreaser

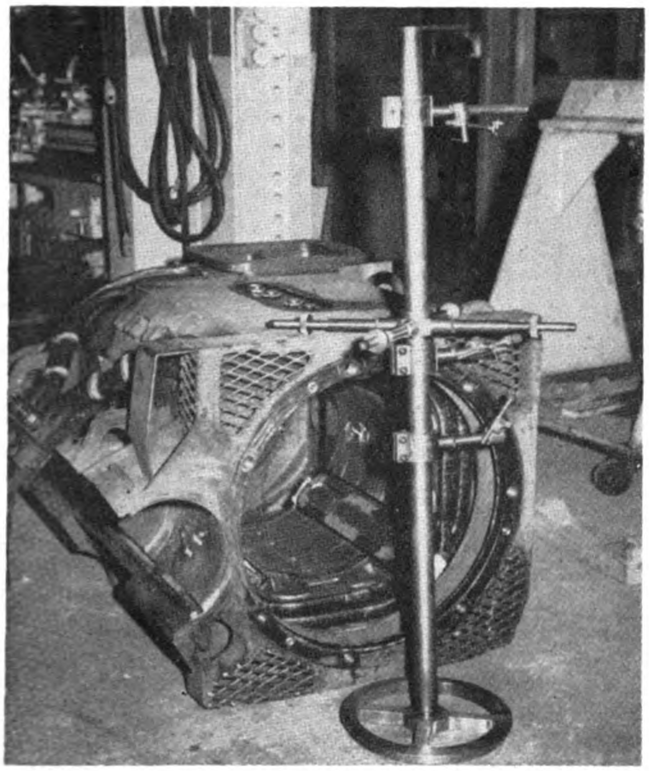


Fig. 6—Gage for measuring accuracy of bearing housing fits

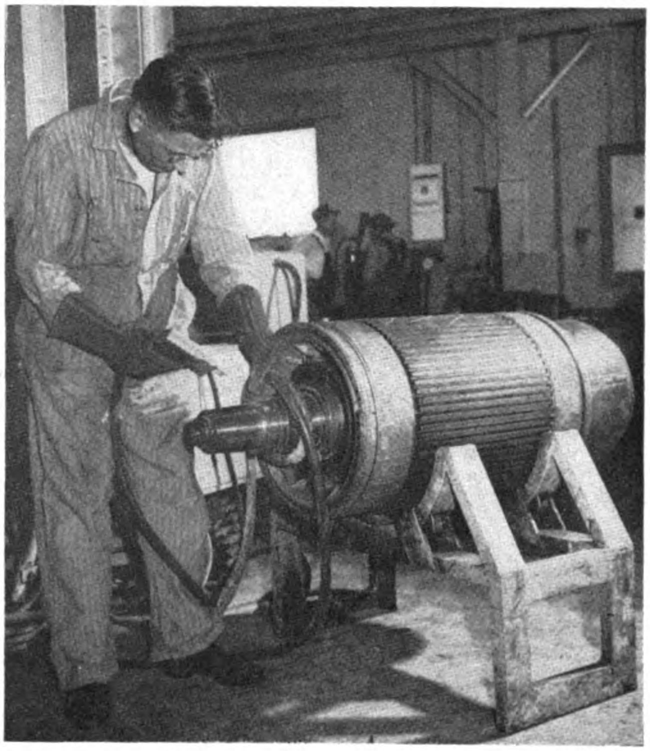


Fig. 9—The stand permits rotation of the armature while the shaft is being Magnafluxed

parts have exposed surfaces painted. They are then ready for application after work is completed on the frame. Support-bearing caps are cleaned separately, since their application is the final operation before the motor is shipped out.

(*Continued on page 94*)

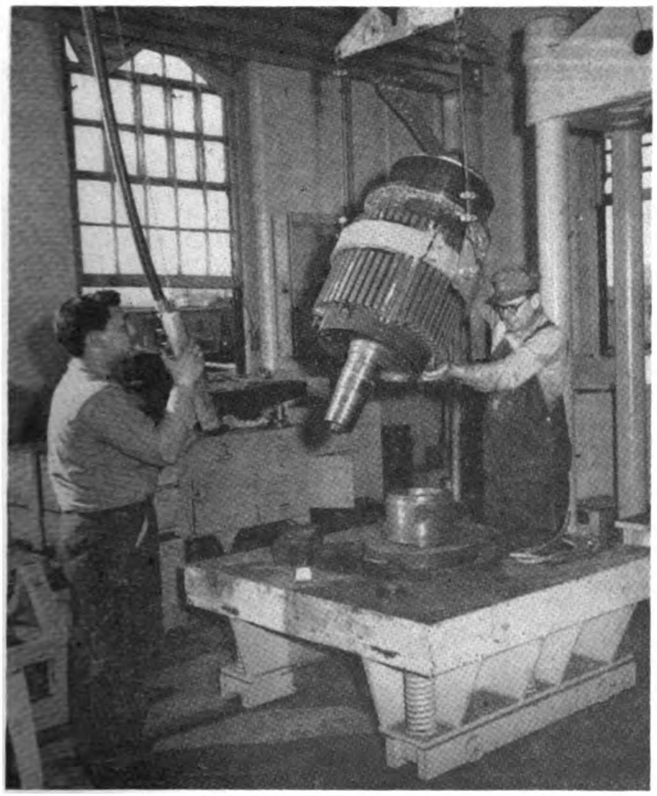


Fig. 7—A core in a clamp ring being turned from a horizontal to a vertical position

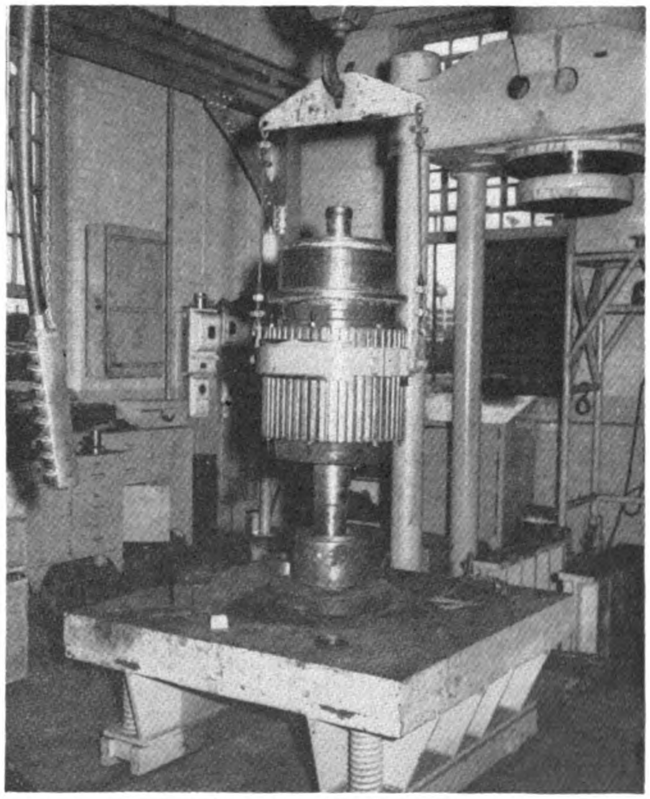


Fig. 8—Armature core being lowered to the bed of a hydraulic press for pressing out the armature shaft

DIESEL-ELECTRICS—How to Keep 'Em Rolling

7 Inspection and Tests*

The condition of motor suspension bearings may easily be responsible for early traction motor failure

Just look at it! Roller bearings destroyed; frame head distorted; armature head smashed. Windings have been thrown out from the slots, and the armature is locked between the poles. The pinion had to be cut with a torch to release the locked drivers so that the train could be moved. What a mess!

Now the motor is taken out of the truck and you examine the damage. What could have caused it? Yes, the bearings failed—but why? Was it a defective bearing, or lack of lubrication? Were the bearings misaligned, or did the pinion-end bearing overheat from dry gearing? Which bearing failed first?

What Can Be Learned from A Traction Motor Failure

With the evidence largely destroyed, the chances of putting a finger on the cause are small indeed. Sometimes a careful study of the remaining parts will give clues which narrow the field to one or two possibilities. For instance, examine a piece of the broken brass bearing cage. Look at the sections that separated the rollers. If they are badly worn, the chances are that poor lubrication caused the failure. If they are not worn, you will have to look elsewhere for the cause. Perhaps it was a defective bearing, or sudden overheating from dry gearing. Do the pinion teeth show such evidence?

It's a tough job getting the story out of the broken parts—one that challenges the ability of the best maintenance man. But there is always the chance that such an unfortunate and costly failure may carry a lesson pointing the way to better maintenance methods. Don't pass it over lightly, or you may miss the key to your problem.

How much better it would be to catch the fault before destruction occurs. Examining the other motors in the same locomotive after such a failure may tell a valuable story. This is especially true if lubrication schedules have been negligently passed up. Then you may find bearings dangerously low on lubricant. At times—believe it, or not—such a check has revealed wrongly assembled bearings. The loose lip for taking the thrust in the commutator-end roller bearing (commonly known as the "H" piece) has been found reversed (see Fig. 2). In other cases, measurements have revealed bearings with too little internal clearance to allow for expansion when heated during operation. By discovering faults before they cause failures, you have the chance to go back and correct the trouble at its source.

It Pays to Check Up

Nothing can take the place of regular, systematic checks of equipment. They are the heart of any preventive maintenance program. An orderly inspection, measurement, or test of parts insures their fitness for another period of operation. Not only does it detect faults before they cause failures, but it also is a way to

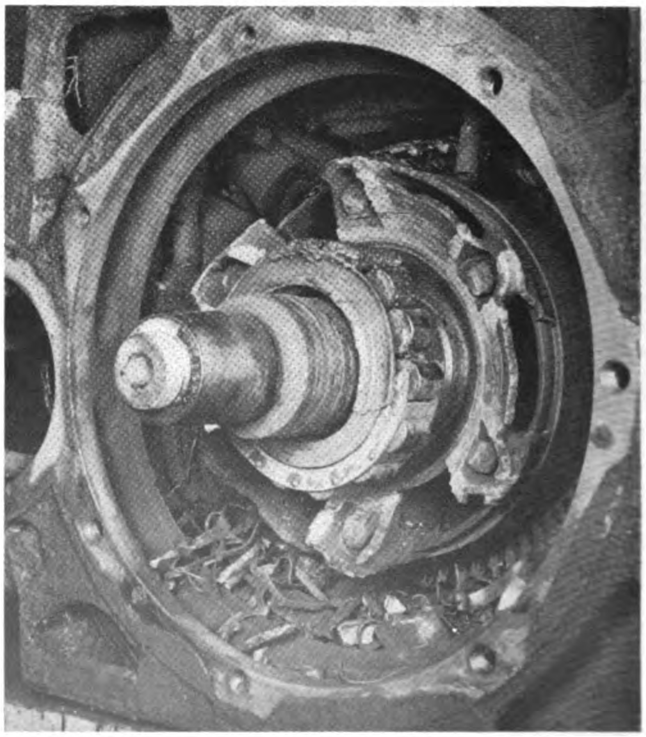


Fig. 1—Such an unfortunate and costly failure may carry important lessons for the maintenance man

* This is the seventh of a series of articles on maintenance of diesel-electrical equipment. This article is written by J. W. Teker, Motor Engineering Division, General Electric Company, Erie, Pa.

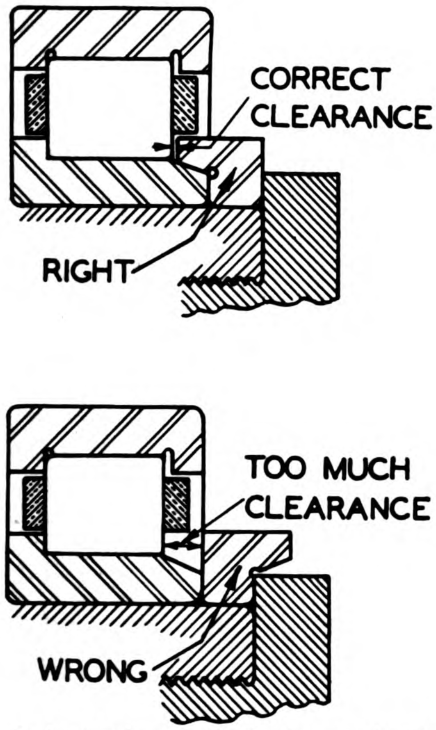


Fig. 2—An improperly assembled bearing may lead to failure

find the cause of the trouble before the evidence is destroyed. Remember, failures do not just happen—they are caused.

Some parts require attention more often than others. Sliding and moving parts, such as brushes, commutators, bearing linings and gears are good examples. These must be watched more closely than fixed parts, such as pole pieces, field coils and cables. Many parts can be checked quickly with an educated glance. Others will not show their hands so easily. Then they must be measured or tested.

Begin With Motor Suspension Bearings

Let's see how such a check works out on the oil-lubricated motor suspension bearings. Turn your flashlight on the axle cap. Glance at the cap or lid on the oil filler pipe. Is it missing or smashed? If not, is is tight or flapping loosely with a broken or missing spring? A quick lifting touch with the finger tells the story. You have made your first measurement and tested the filler pipe cap. No instruments were required other than your finger which you used to judge the spring action on the lid on the oil filler pipe.

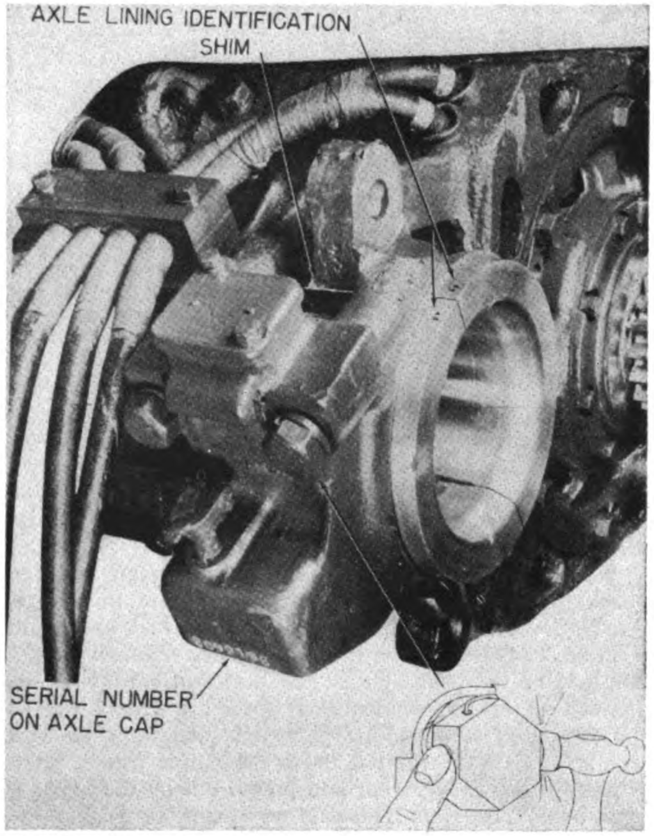
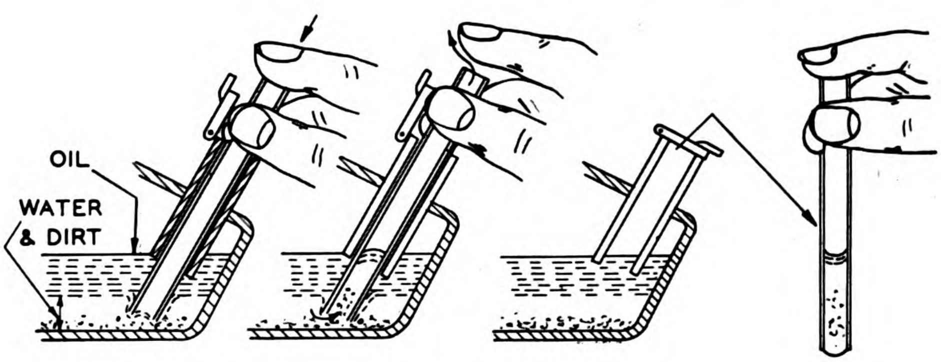


Fig. 4—Significant points in motor axle cap assembly, and method of checking for loose bolts

Suppose the lid is loose or lost. What harm has been done? Water and grit may have washed into the oil well. A dip stick might not show this because it would pass through the layer of oil floating on top of the water. Of course, you can remove the oil well drain plug. There is a quicker way, however, when you can reach the bottom of the oil well from the filler pipe. Take a piece of glass tubing, like that used in water level gages. Close the upper end with your finger and plunge the tube to the bottom of the oil well (Fig. 3). Take your finger off for a moment to let the trapped air escape from the tube. Whatever is on the bottom of the well will rush into the tube. Replace your finger over the end and lift the tube out of the oil well. Wipe the oil off the outside of the tube and examine the sample drawn out for water or grit. This time you have used a simple instrument in your test—the glass tube.

It might be a good plant to make the test just de-

Fig. 3 — A simple test for water and dirt in axle cap oil wells



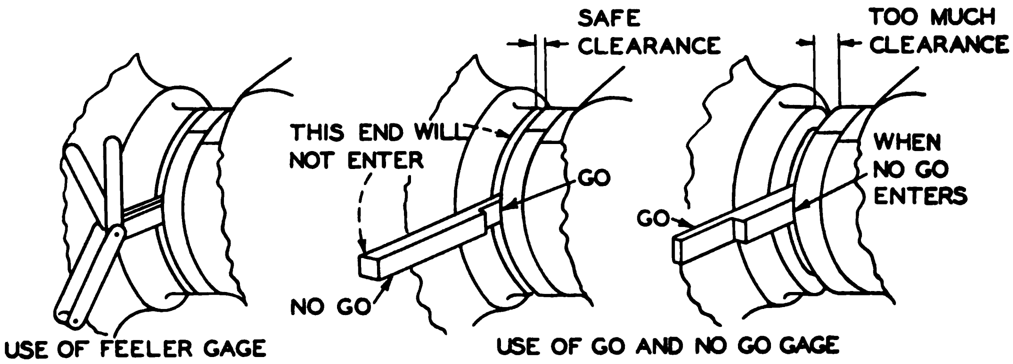


Fig. 5 — Two methods of measuring lateral clearance with gages

scribed, even if the filler pipe caps are in good shape. At certain times of the year water can accumulate in the oil wells by condensation. It may also get in from wheel wash during operation on flooded tracks. At the time this test is made, the waste packing chamber covers should also be checked for faulty or missing gaskets.

While examining the axle caps, it is a good thing to check the bolts which clamp them to the motor frame. Are these tight? Hit the bolt head a sidewise blow with a hammer. At the same time hold a finger on the opposite side of the head against the bolt and cap (Fig. 4). Do you feel any movement? If so, get a wrench on the bolt and pull it up solid. The axle cap must be held tightly against the joint faces in the motor frame. If it is loose it will move, wear and pound out by the blows it gets from the axle. There is no spring or cushion to pull the punches of a speeding axle, so it hits hard. A rusty fringe will usually show around the joint line between loose parts, unless they are too oily. This rust is the clue to watch for.

Loose axle caps may allow bearing linings to chuck back and forth with the axle. This not only wears the outside of the linings, but also laps out the motor frame lining bore. In addition, the loose bolts jiggle and wear their own threads as well as those in the motor frame. Of course, you can easily replace worn bolts and linings;

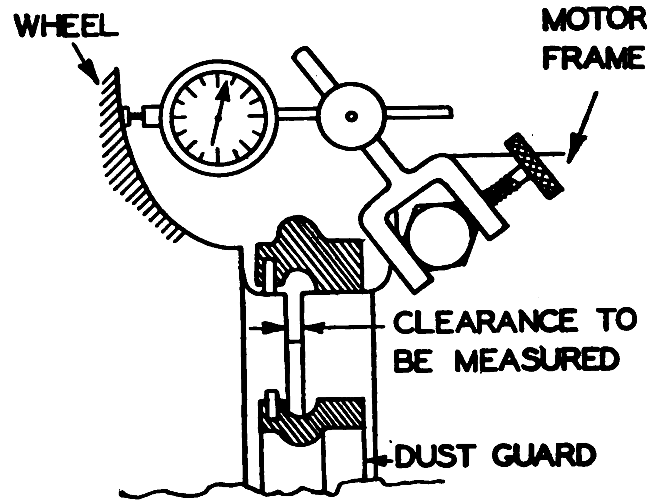


Fig. 6—A dial indicator may be used to measure lateral clearance without removing the axle lining flange dust guard

but restoring rabbet fits, bores and threads in motor frames is a costly repair job.

When you look at bolt locking devices, don't let them fool you into a false sense of security. Just the fact that

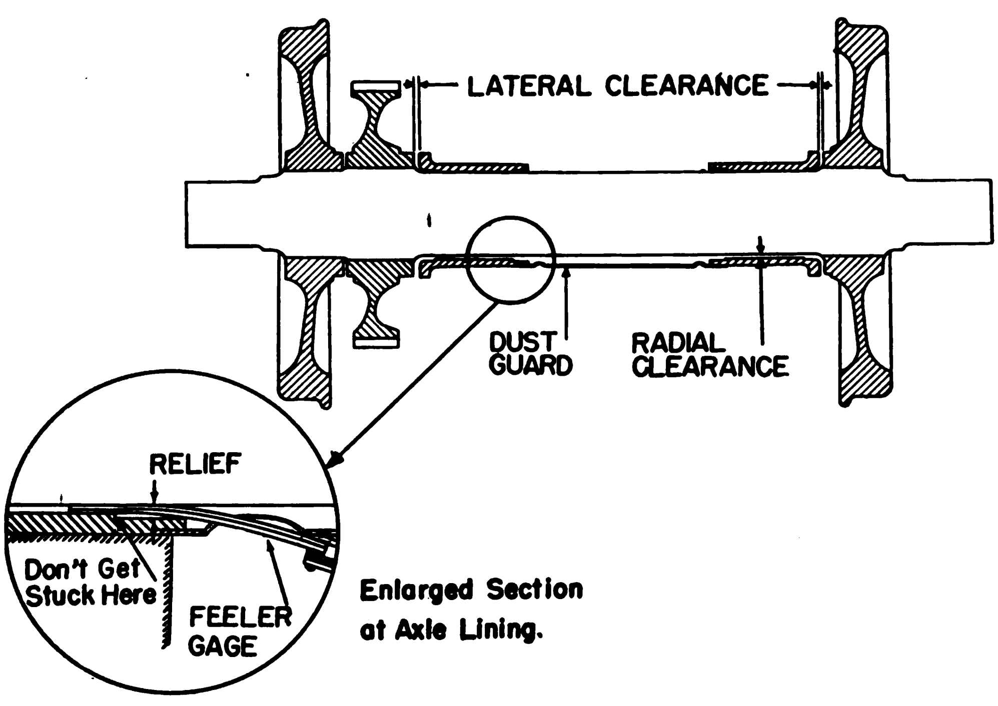


Fig. 7—Radial clearance may be measured with a long, flexible feeler gage

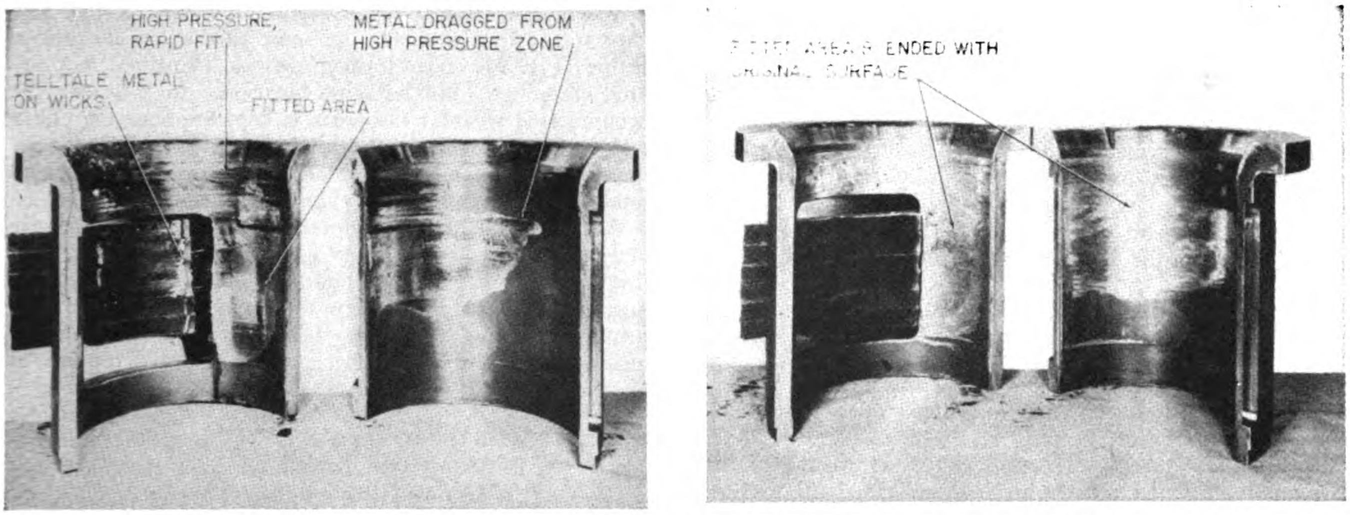


Fig. 8—Axle linings in which the bearing metal has been dragged may often be reconditioned to give further service—on the left are the lining and wicks as removed from the motor—on the right is the same set of linings cleaned up

they are there doesn't mean that the bolts are tight. Even lockwashers "dig in" with the repeated shocks and blows from the axle. This lets the bolt tension slacken. The locking wire or clamp has no means of tightening a loose bolt. All it can do is keep the bolt from turning and falling out. That is important, though, for without such precautions bolts have been lost along the right of way. Axle caps have even been known to fall off. Don't let this happen on your job. Even though locking devices can't tighten loose bolts, see that they are properly applied. When they do their job well, you have a chance to do yours. Periodic checks and tightening is the way to keep everything snug. Remember, worn axle cap fits and threads are evidence you can't hide from the backshop gang when they have to build up and remachine these parts.

Some motors are built with shims between the axle cap and frame joint faces. In this case, the first light squeeze fit on the linings can stand some watching. Shims should be removed to tighten the squeeze before serious wear occurs. After linings have fitted in and taken some pounding in service, they may be ready for additional squeeze. Certainly, when you find the linings so loose they are causing wear, it is past time to remove the shims. Better late than never, though, for the longer you wait the worse the damage. When the shim space is used up, major repairs follow.

Today many road locomotive motors are built without shims in the axle linings. These depend upon a strong grip of the lining right from the start—and upon the maintenance of tightly clamped axle caps.

After all is said, why not check for tightness? Only a hammer is needed. What's more, it pays—wear just doesn't have a chance when parts don't move.

How About Lateral Play?

More precise equipment is needed to check the lateral play of a motor on its axle. First, it is necessary to push the motor tightly against the gear hub with a jack or bar. Then the clearance between the wheel hub and suspension bearing thrust flange may be measured with a feeler gage (Fig. 5). Check this measurement against the recommended limits of wear. You may find a "Go or No Go" gage (Fig. 5) handy. It saves fiddling with feeler gage thickness combinations. Just grind the small or "Go" end to the minimum limit, and the large or "No Go" end to the maximum limit. Now you can tell whether the clearance is in or out of limits without having to read and add numbers. Of course, if there is an axle lining flange dust guard in the way, it must be removed to allow these measurements to be made. This is a good time to check the drain hole in the dust guard. It should be on the lower side. Sometimes it is mistaken for an oil hole and put on the upper side. Then it catches dirt and funnels it into the bearing.

A faster method, in which the dust guard need not be removed, is to clamp a dial indicator on the motor (Fig. 6) and let it bear against the wheel. Now push the motor over one way and set the indicator. Then push the motor as far as it will go the other way and read the dial. This is the total lateral play. The dial method is particularly good when you are keeping records on the rate of wear.

Just a word of caution about pushing the motor from side to side. Be careful to apply the pressure on the motor frame so as not to damage it. Watch out specially for the commutator end armature bearing cap. Unfortunately, this comes just opposite the wheel rim, and so it is the most tempting spot to use a pry bar. Don't yield to that temptation! If you do, you may dish the cap in against the bearing and cause a failure.

But why all this fuss to check end play? First, all motors need running clearance at the thrust flanges. No end play would result in trouble with hot suspension bearings and rapid wear of the thrust faces. The usual minimum is $\frac{1}{32}$ in. at each end, or $\frac{1}{16}$ in. total. If you find less than this, start looking for linings out of place—especially if the motor was just mounted on the axle. Loosen the axle cap bolts and shove the linings back where they belong, tight against the motor. Then set up the bolts again. Second, if there is excess clearance at the thrust flanges, the three tons of motor will slam back and forth on the axle. This will bring no good to the track, the truck, or the motor. Furthermore, if there is too much end play, the gear teeth will strike the gear case and do a swell job of chewing it up.

Radial Clearance Is Important Too

The radial, or up and down, clearance of suspension bearings can also be checked with feelers. Use a long,

slim flexible gage for the job. Push it in between the bottom of the axle and the lining. That is where you will find the total radial clearance, because the weight of the motor is on the top of the axle. Slots, either open or with spring covers, are provided in the bottom of the axle dust guard. This means you do not have to remove the guard, but you do have to work blindly and go by feel alone. Don't be fooled by measuring the relief step clearance at the end of the lining (Fig. 7). Be sure to push the gage in far enough to get around this step.

No Oil—No Lubrication

If the lateral or radial clearance show a sudden increase, it may be wise to check the waste packing or the felt lubricators at once. You may head off a failure in this way. Look for glazing of the wick surface that rubs on the journal. It may have overheated and formed a hardened crust which doesn't feed oil to the journal. Look for gear lubricant working in to clog the wick. Tarry residue in the oil will do the same thing. Maybe your local oil supply checks okay. But if you suspect that bad oil is being added elsewhere, have a sample checked. A laboratory can readily tell you whether it meets specifications.

What about the wool waste packing? Is is up to par? Was it soaked in warm oil and drained before being used to pack the bearing? This wets the fibers with oil, removes the sizing, and so helps the wick to feed oil to the journal properly.

Remember that wicks rotted by water or damaged by cleaning solutions will not feed oil properly. Also, it may be that the wick is all balled up because of improper packing of the bearing. It is a good idea to review the manufacturer's instructions on this point from time to time. You may be surprised how easy it is to get off the beam.

If felt lubricators are used, check the springs on the pusher plates or lubricator wick arms. There is even a chance that the oiler failed to fill the axle cap reservoirs to the proper level on schedule. Check that also.

Sometimes traces of bearing metal will be found on the lubricating surface of the wick or at the edge of the bearing window. This may be especially noticeable when linings are removed for making wheel changes. Then you can have a good look at the bearing surface and see where this stray metal is coming from. The lining may be so badly melted out as to require replacement. More likely it will be only dragged over in some places, particularly at the outer ends (Fig. 8). This is where the lining is most likely to cramp on the axle before it gets fitted in. Also, the heavy gear loads when starting trains may shove the axle over in the bearing bore from its top position to the side. Such high pressure fits the relief edge of the lining to the axle so fast that the soft bearing metal is pushed out of place. Lubrication is not always at its best under such conditions either. So some melting can be expected until enough area is fitted in, and oil gets there to take the load.

Such a bearing, at first glance, may look much worse than it really is. When the loose and dragged overlayers of bearing metal are scraped off, an adequate contact area is usually revealed (Fig. 8). This should be smoothly blended with the surrounding surface. The bearing should then be used again in its original position on the axle, along with the other end lining. Really, it is now better fitted for service than a new lining. The mating gear and pinion will like this too, because you are not disturbing the distance between their centers.

When assembling, check serial numbers on the axle caps to see that they are the same as that on the motor frame (Fig. 4). Axle linings are also identified in pairs and should go into the same location. In this way the accumulated wear of the parts is kept together for check and restoration at overhaul. Otherwise, defects get scattered and escape correction. Then they hurt over-all quality, and may lead to serious trouble.

All in all, sleeve-type motor suspension bearings are, large, simple, sturdy pieces of machinery. Their running maintenance is simple and easy to do. The tools required for checking are few and readily available. By properly caring for these bearings, you will reduce chances of failure in service and of costly repairs at overhaul time.

Diesel-Electric Shop Equipment

(Continued from page 89)

Bore and Face Gage

The device, shown in Fig. 6, is used to determine the accuracy of the machined fits on the motor frame for the commutator and pinion-end bearing housings. Accuracy of the bore for the commutator-end housing is first determined with a micrometer. The motor is then placed on end, with the commutator-end down, and the circular template shown in front on the floor is fitted into the bore so that the shaft extends upward along the center line of the frame, with its lower end on a single ball bearing in the center of the template.

The four adjustable arms are then extended against the pinion-end bore and adjusted until the shaft is centered. This is determined by a dial gage on the end of the top horizontal arm. As this is rotated with the gage finger against the bore, it serves to center the shaft and, at the same time, to show if it is a true circle. The dial is then rotated 90 deg. on its horizontal arm and used to measure the accuracy of the pinion-end face.

Clamp Ring for Core Handling

Figures 7 and 8 show a method of handling armature cores which makes the work easy and allows the operator to turn them to any desired position. It consists of a two-part steel clamping ring which makes a circle the same size as the armature core. The ends of each half of the rings are flanged, so that they may be pulled together by two bolts on each side. The ring is applied at the balancing point of the core. Strips of heavy rubber sheeting are placed between the two halves of the ring and the core to prevent injury to the laminations. On opposite sides of the ring are two swivelled hooks. The core is supported from the crane hook by a yoke and two short lengths of steel cable as shown in the illustration.

Magnafluxing Stand

The procedure used for magnetizing and applying flux to an armature shaft for Magnaflux testing is shown in Fig. 9. One turn of the magnetizing cable serves to magnetize the shaft, and the armature is rotated on a special stand while the shaft is inspected. Discarded bearings, set into four slots in the stand, support the armature and allow it to be turned easily.

EDITORIALS

Who Has First Call On Diesel Instruction?

A program of instruction in diesel maintenance which gives preference to younger men to the exclusion, or near exclusion, of older men can be a good policy in some cases but a serious mistake in others. One case would be where servicing or repairs were formerly handled at a number of scattered points on a district with steam power; with the advent of the diesel these are to be concentrated at one central point.

The second case would be where the servicing and repair of diesels is merely being substituted for the servicing and repair of steam power, and where the total traffic to be handled by the diesels assigned to the point for maintenance does not differ appreciably from that formerly handled by steam. In many instances these conditions would be met for all practical purposes when the major steam back shop is converted to diesel repairs.

The advantages there are in teaching younger men, and the advantage in having a shop force with a sizeable number of well trained young men, will be realized in situations similar to case one. The same advantages might be illusory in case two, and the final consequences somewhat lacking in sense. The results depend on whether the repair force is to remain constant or to increase in number, or whether it will tend to decrease. It will follow the first tendency in situations similar to case one, the latter in situations like case two. How this can be true is apparent from examination of why any new power is bought in the first place.

New locomotives, whether they be steam, diesel or electric, are bought to save money. One of the ways they do this is by reducing repair expenses, which is normally accompanied by a reduction in repair forces. What can happen under such circumstances if only young men are trained is easy to foresee.

As the number of diesel units increase, and the number of steam locomotives decrease, the manpower requirements for handling the steam likewise decrease. The steam men therefore, willingly or unwillingly, must bid in the diesel jobs or be laid off. Those who were working the diesel jobs, often the younger men, are bumped.

It is unlikely that as many men will be required to maintain the diesels as were needed on steam for two reasons. One is that the diesels are new, and the second is that a greater portion of parts are bought for the diesel rather than made in the shop as was the practice with steam. These factors are compensated for in case one because the work load of the locomotives assigned to the point is increasing in terms of the traffic they are to handle. Such compensation is lacking in case two.

What then can be the final results if only the younger men are trained to work on diesels while the training of the older men is neglected? As maintenance costs and forces are reduced the older men must take diesel jobs or be laid off. Many of the younger men who have been trained will be laid off, and diesel maintenance is in the hands of those who are neither trained to do this work nor perhaps even particularly want to do it. As a matter of self protection it is therefore wise to see to it that the older men get the basic training required to enable them to do a competent job when called upon to service and maintain diesel power.

One Electrical Section

The two Electrical Sections of the Association of American Railroads are now one, and Steven W. Marras, formerly of the Illinois Central, is full-time secretary. The Section will function for both the Mechanical and Engineering Divisions. The new arrangement affords a fine, broad street for travel, with a few open manholes and some ruts which need be avoided.

It has long been the ambition of some of the members to have an Electrical Division, but this would have its shortcomings since things electrical are part and parcel of most of the work done in both the engineering and mechanical departments. With one Section, both departments are served by the best electrical talent there is available on the railroads.

The greatest hazard to usefulness of the Section lies in the very consolidation itself. If the Section lays too much stress on the making of recommendations, if its decisions become too important to member railroads, its behavior will become stiff and unproductive of information which everyone needs. That is an open manhole The ruts consist largely of following old patterns of procedure, of failing to see new things which should be done and not getting enough new men on the committees who can give some time to this work

The Sections will continue to hold joint meetings with the Coordinated Mechanical Associations and electrical and mechanical exhibits being held on alternate years. This arrangement is a powerful influence against too much officialdom. The primary objective of the joint meetings is production of useful information and discussion which is not restricted.

Differences between the two groups should be recognized. The Coordinated Mechanical Associations are made up largely of men who are more directly in charge of maintenance operations than those in the Electrical Section. The electrical men, as a group, are in large measure engineers who give much attention to selection of equipment and the development of maintenance procedures. Each could profitably take a leaf out of the other's book. If conflict or rivalry does not prevent it, this will probably happen automatically. The operators are bound to gain more technical information, and, as the electrical men are drawn more closely to everyday

operation, they will acquire a greater consciousness of the relationship of work done by the two groups.

The great need for solving many new problems is shown by the diesel clubs and schools that have grown up all over the country. Their work is vital, but lacks coordination. In addition to its regular work of producing reports and making recommendations, the Section could also render valuable service to the industry by acting as a clearing house, selecting and recording the best information that is being developed by some of the other organizations currently dealing with subjects vital to the members of the Section.

Maintain 'Em— Or Scrap 'Em?

A study of the fortieth annual report of the Bureau of Locomotive Inspection, Interstate Commerce Commission, which appears on page 71 of this issue will serve, once again to place emphasis on the fact that the job of maintenance that is being done on the remaining steam locomotives in this country may leave much to be desired from the standpoint of safe and economical operation of motive power. We may be wrong about it but it looks as though the railroads, by and large, have concentrated so thoroughly on the problem of keeping the newer diesel-electric power in running condition that they have more or less forgotten the fact that there are still well over 20,000 steam locomotives in service and that it is just as important to keep them in first-class condition as long as they are being operated as it is to keep the newer diesels in first-class condition.

Of the inspections made for the year ended June 30, 1951—62,113—12.9 per cent were found defective. The number of defects found totalled 34,657 and 508 locomotives were ordered out of service. The 12.9 per cent which were found defective is the highest percentage of defective locomotives since the year 1930 and the railroad mechanical departments do not deserve any medals for allowing any conditions to spoil a 22-year record of accomplishment in this manner. It is bad enough to have an increase in the percentage of defective steam locomotives but when we find that the number of persons killed as a result of accidents due to defects doubled in one year that is still more serious. Three of the 14 persons killed and 59 of the 170 injured were the result of boiler defects and the fact that the remainder were the result of defective machinery and parts other than the boiler may, in some respects, be indicative of a lack of necessary attention to maintenance details of steam locomotive parts other than the boiler.

The statistics with respect to locomotives other than steam are not too encouraging either. The percentage of defective locomotives in this category has almost doubled since 1946; the number ordered out of service has increased over six times in that period (allowance must, of course, be made for the rapidly increasing number of diesel-electric units) and the number of accidents and injuries due to the failure of parts on locomotives other than steam have shown a continual increase.

It may not be out of order to remind mechanical men, once again, that there are going to be steam locomotives in service for some time to come and, if as a matter of policy or otherwise, an attitude of mind is being developed with respect to steam power that maintenance standards need not be high, then it might be worth while not to raise any question as to whether they should be maintained but the policy should be—maintain 'em, or scrap 'em.

New Books

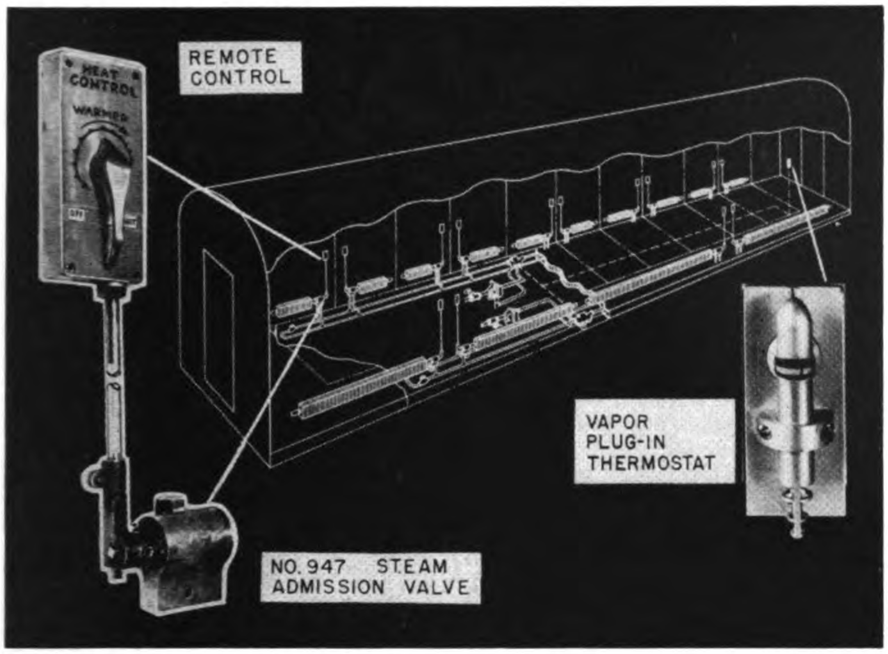
INDUSTRIAL FURNACES. *Fourth edition, Volume I. By W. Trinks. Published by John Wiley & Sons, 440 Fourth Avenue, New York 16. 528 pages, 6 in. by 9 in. Cloth bound. Price, $10.*

This fourth edition of Industrial Furnaces, which discusses the basic principles underlying all furnace design and operation, incorporates the most recent scientific facts which research has discovered about heat transfer and furnace design as well as present-day design and operating principles and techniques. Infrequently used material has been moved to the appendix, and all calculations and tables have been changed from gross tons to net tons in accordance with current usage. The volume is divided into sections on the capacity, economy, thermal efficiency, strength and durability, and movement of gases in furnaces. The new material includes data on increase of furnace capacity by high-(thermal) head heating; heating by induction, effect of arrangement of stock in furnace; thermal conductivity and diffusivity; heat loss through walls of lightweight firebrick; fuel saving by permeable walls; zone heating; simplified calculation of heat transfer by radiation from clear gases; heating of aluminum; heat-resisting alloys; new furnace elements, etc. Ninety-four new illustrations have been added.

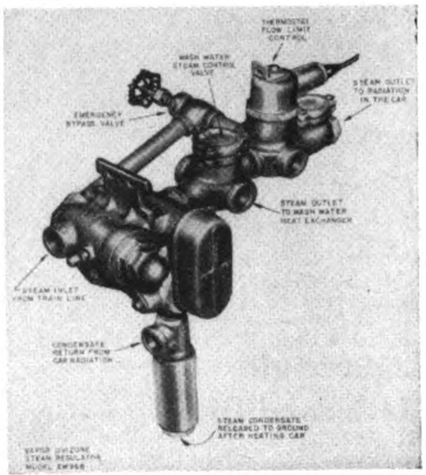
THE SEAMLESS STORY. *By J. Perc Boore, with technical bibliography compiled by Victor S. Polansky. Published by the Commonwealth Press, 1507 DeLong street, Los Angeles 15, Cal. 285 pages; 6 in. by 9 in. Cloth bound. Price, $5.75.*

The Seamless Story is a history of the seamless steel tube and its development. It contains biographies of the persons which were and are the seamless tubing industry and an outline of contemporary mills and how they developed into their present form. The data, gleaned with periodicals, new stories and libraries all over this country and Europe, are technical only to the extent necessary to develop the historical account. A story on the rolling process developed by Reinhard and Max Mannesmann, whereby a solid steel bar could be converted into a seamless steel tube, and the piercing machine developed by R. C. Stiefel; a history of the seamless steel tube industry in the United States, including the story of Shelby, Ohio—described as the "Home of the Seamless Steel Tube Industry"; a brief account of the individual tube companies which Shelby absorbed; a brief history of contemporary mills, and a story of redraw mills comprise the five parts of the book. The bibliography by Mr. Polansky of the Carnegie Library of Pittsburgh is a revision of one published by the library in 1928, the material being brought up to the end of July 1951.

NEW DEVICES



Vapor Moduzone steam heating system for sleeping room cars



Vapor Unizone steam regulator which is thermostatically controlled to feed steam to the radiation as needed and may be quickly removed as a unit

New Vapor Heating Designs

With a view to providing automatic heating equipment of adequate capacity and flexibility for both new and modernized passenger cars, the Vapor Heating Corporation, Chicago, has been concentrating on improvements and refinements in design which simplify the construction, minimize the individual parts required and hence tend to reduce first cost, labor of installation and maintenance in service.

The new Vapor Unizone system for coaches or any open-body car, for example, uses only one thermostat and one steam regulator (two regulators may be used if desired) which automatically supplies steam to the floor and overhead radiation and steam for the wash-water heat exchanger. Only nine compact units of five standard Vapor parts are required for accurate temperature control when one regulator is used with this system, the parts weighing less than 60 lb. per car set. The general arrangement of the Unizone steam regulator is illustrated. Underneath piping is simplified and minimized and car heating pipes insulated with the trainline for increased efficiency.

For sleeping room cars, the Vapor Moduzone system has been reduced to two master thermostats, two skin thermostats, three steam regulators, and a steam admission valve in each room with remote control so each passenger may keep the room as warm as desired.

A new Moduzone steam admission valve is installed on the unit-fin radiator in each sleeping room. By turning the remote control selector, connected by cable to the valve, the passenger adjusts the valve orifice to admit more or less steam as needed. Warm air is also circulated into each room through overhead louvers which may be adjusted by the passengers.

The new Vapor Aquazone heating system uses liquid as a heating medium, circulated by an electric pump through the floor and overhead heating radiators. The liquid may be water or a non-freezing solution. It is heated by train-line steam fed into a heat exchanger by a standard Vapor steam regulator; by waste heat from diesel engines in the cars; or by a small automatic Vapor heater, fired by oil or propane fuel. These liquid systems are also controlled by thermostats to keep the cars comfortable.

Liquid heating systems are well adapted for use on certain types of cars such as some electrified trains or on business cars which need an independent system to heat the cars when no steam is available.

Chemical Cleaner For Tubes

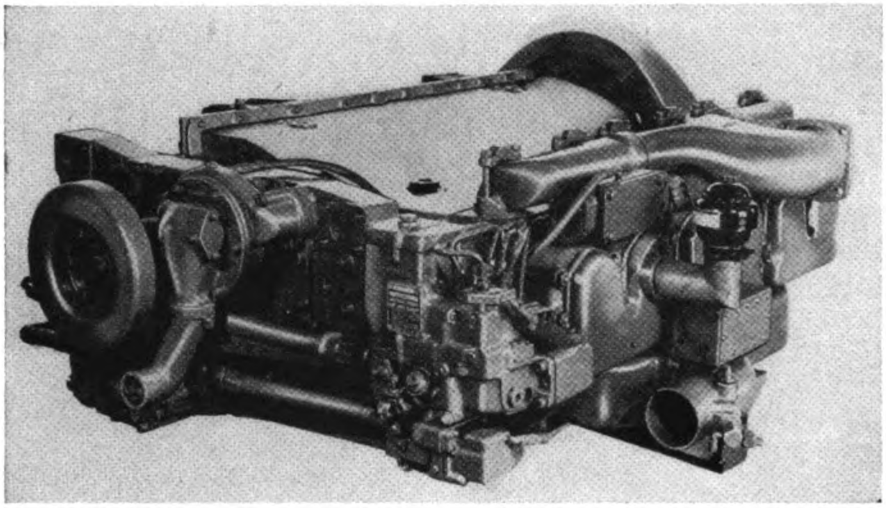
A new cleaner called Magnus 751 for the removal of carbonaceous deposits from the tubes of fuel oil heaters without need for dismantling the equipment has been announced by the Magnus Chemical Co., Garwood, N. J. Cleaning is accomplished by exposing the deposit on the tubes to the action of the compound.

Experience of a power plant of a large western railroad will indicate the essentials of the method:

An empty 55-gal. drum was equipped with a reversible flow gear-type pump with a capacity of 3-gal. per min. On the oil heater, all valves were closed and the oil drained. A pipe is connected from the drum to the inlet port of the exchanger. A mixture of one part by volume of 751 with 2 parts of water is put in the drum and the pump started to move this solution through the exchanger. Steam is turned on in the exchanger to maintain a temperature of 140 deg. F.

The solution is circulated in the exchanger for 8 hr. It is then discarded and a fresh solution is pumped in a reverse direction for about 10 hr. At the end of this pumping period, this solution is left in the exchanger for another 14 hr. When it is finally drained and flushed with water, a clean system is obtained.

For a 6 ft. by 2 ft. exchanger, about 30 gal. of solution does the job in about 32 hr.

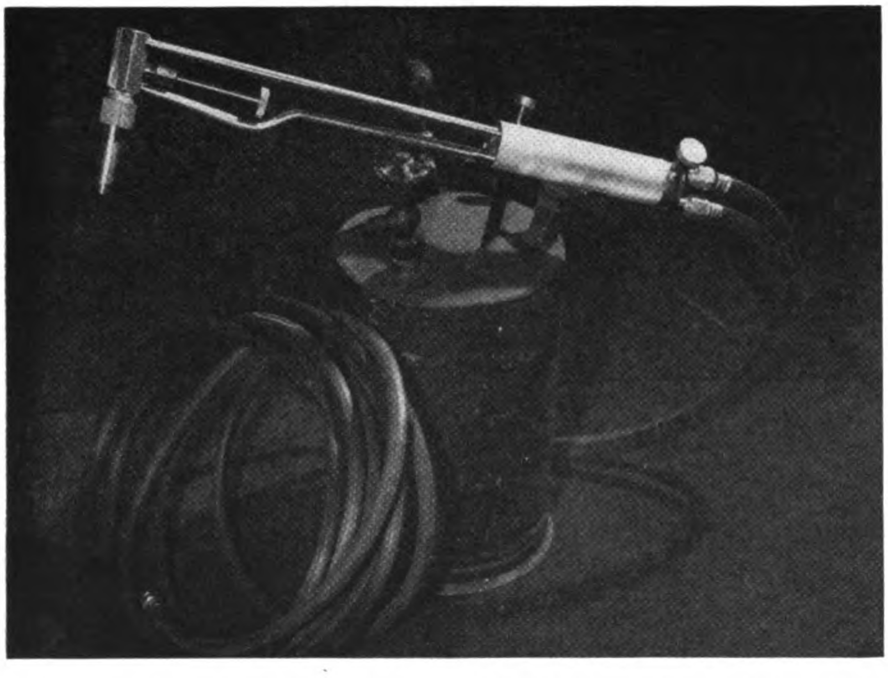


Lightweight Horizontal Diesel

The Cummins Engine Company, Inc., Columbus, Ind., announces the availability of the new horizontal 200 hp. model NHHB-600 diesel engine. This latest addition to a line of 84 models of lightweight units has been designed for rail car applications and for city and intercity buses.

It is a 6 cylinder, full diesel, which produces 200 hp. at 2,100 r.p.m. and has a compression ratio of 15.5:1. Displacement is 743 cu. in. with a bore and stroke of 5⅛ by 6 in. Its weight is 2,285 lb.

Dimensions of the engine are: length 63$^{15}/_{16}$ in., width 55¼ in., and height 22¾ in. This size makes it adaptable for underfloor installations. The diesel fuel recommended for use in this unit is lower priced than the fuel burned in most other types of diesel coaches.



Gasoline Cutting Torch

A recently developed cutting torch has been marketed which burns gasoline and oxygen. It is said to bring an overall saving of 25 to 30 per cent to such operations as cutting, brazing, scarfing, and similar work. The device is manufactured by the Browning Torch Corp., and is distributed by Steel News Industries, Inc., Canonsburg, Pa.

Advantages claimed are reduction in bulk and weight by the use of small gasoline cans, and a cutting head design which eliminates backfiring and backflashing into the handle.

Basically, the unit operates in the same manner as the gas torch. It blends liquid gasoline and oxygen, which is converted into vapor in the tip by the heat of the flame.

Feed Nozzle Bushing

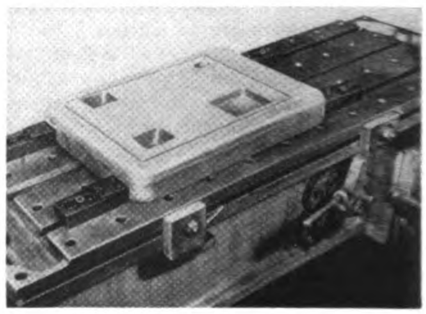
By adding a Carboloy cemented carbide bushing inside the conventional feed nozzle tip for automatic arc welding, the General Electric Company at its Fort Wayne Works has increased life of nozzle tips up to 20 times. Wear is no longer a problem, and burning effect greatly reduced, it is claimed.

In one case where the coiled electrode wire is especially abrasive, brass nozzles had to be replaced 6 to 8 times a week. The carbide protected nozzles are giving a service life of 3 months and better. On other operations where former life had not exceeded 3 weeks, the carbide nozzles are lasting as long as 12 months. In addition to the improved nozzle life, a more uniform narrow weld can now be maintained, as accurate guidance of the wire—formerly difficult once wear developed—is no longer a problem. In view of these several benefits, the use of carbide-equipped nozzle tips has been made standard on about 20 automatic arc-welding machines.

Improvements have been made with Carboloy cemented carbide at two other points in order further to reduce downtime and maintenance cost on arc-welding equipment. A carbide guide ring—added inside the fibre guide which keeps the electrode wire from riding off the overhead pulley—eliminates any possible danger of short-circuits from wire wearing through the fibre insulation and coming into contact with the metal support arm.

The final application was at the guide block which locks the electrode wire in position against the conical feed rolls. When wear occurred at this point, positive feeding was impaired. To eliminate this condition the guide block is now tipped with a standard Carboloy cemented carbide blank. The face of the blank is ground to provide a slight radius.

◆



Planer Jaw Clamps

Clamps designed for larger-type planers, with more power than ordinary finger setups are now being marketed by the J & S Tool Co., East Orange, N.J. Called the Jumbo and Lil-Giant clamps, they allow loading and unloading by simply adjusting and loosening one screw.

These units employ a new principle of securing work-pieces rigidly to any machine tool. The jaw travels in and down, at a 45 degree angle, forcing the work-piece

horizontally against the opposite clamp, and downward against the table.

The Jumbo clamp measures 1½ in. high by 2½ in. wide by 6½ in. in length, while the Lil-Giant is 1¼ in. high by 2 in. wide by 5½ in. in length. All are equipped with T-nuts to fit all large planers and with varying nose-grips for special requirements.

◆

Pipe Bend Layout Computer

Using only four readings from a center line, pipe layout is simplified and time saved with these computers recently made available by the Interstate Sales Co., New York 3. Their pointers are made of Vinylite plastic rigid sheet. With this device, engineers, draftsmen and piping engineers can make rapid layouts of pipe bends right on the job.

The computer gives direct readings for any angle of bend up to 126 degrees, in steps of one degree or less, on pipe diameters from one to 20 in. Complete angles of two pieces or multi-piece bends, y-layouts, etc., are read and transferred to the actual pipe, sheet metal, template or drawing board. Only four measurements or readings are required to mark a pipe (by quadrants) at 16 different ordinate points on the circumference.

The circle divider gives instant readings of circumference divisions from ½ to 1/16 in fractions of an inch for any circle up to 72 in. in diameter. This divider is handy for getting ordinate spaces for template layouts.

Both instruments are available in folding type for field use and flat type for the shop. They measure 12 in. square flat, 12 by 4½ in folded.

◆

Large Capacity Dust Collector

An industrial dust collector which requires only 8 sq. ft. of floor space, yet capable of collecting dust from ten grinding wheels in simultaneous operation is announced by Aget-Detroit Co., Ann Arbor, Mich. Known as the model 3050 Dustkop, it has a rated capacity of 3,630 cu. ft. of air per min. at a static suction of 6 in. measured on an 8 in. inlet pipe.

Dirt laden air is drawn into the collector by means of a self-clearing paddle wheel, fan driven by a 5 hp. motor. The first stage cleaner is a cyclone separator. Second stage cleaning is by a fiberglass filter which cleans the air and permits its return to the working space.

Installation requires only locating the unit and connecting to electrical power and piping system. No other connections are required. Being entirely self-contained, the unit is portable and can be moved as subsequent changes in production set-up are made.

Floor space of the unit is 29 by 50 in. with overall height being 132 in. It is powered for use on 220 or 440 volt, 3 phase, 60 cycle power.

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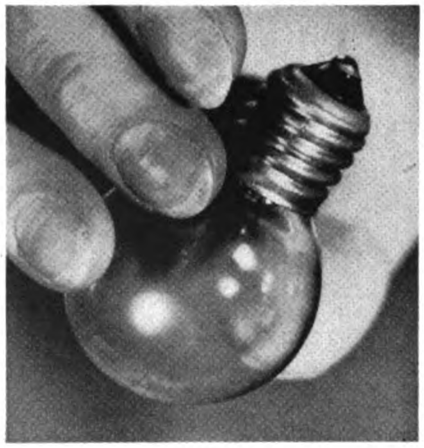
Ozone-Producing Lamp



An ozone-producing lamp, designated as No. OZ4S11, has been developed by the Lamp Division of the General Electric Company in response to demands for a small ozone-producing source to destroy or substantially reduce odors in enclosed spaces. The bulb is of special glass which passes 1,850AU (ozone-producing wavelength) as well as a slight amount of 2537AU (germicidal).

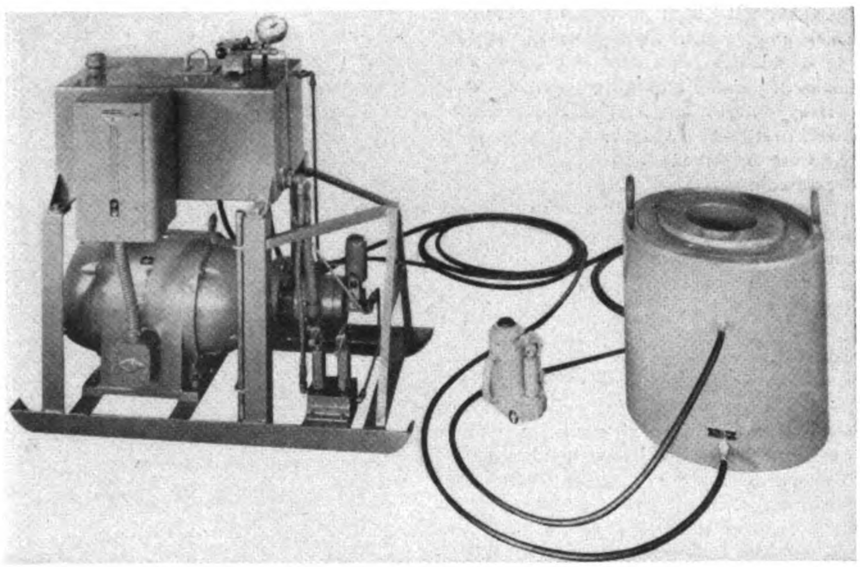
It is an improvement on its predecessor in that its physical strength and ultraviolet output have been increased.

The ozone generated by one lamp will kill or effectively minimize odors and freshen air in spaces up to 1,000 cu. ft., depending on humidity, ventilation and the nature of the odors. Its germicidal output is low—about 1/100 of that of a 30-watt germicidal lamp.

The lamp generates ozone near the outer bulb wall. This is quickly diffused throughout the room or enclosed space. Ozone destroys many odors, freshens air and helps to prevent mustiness.

Ozone chemically changes some odorous substances, but does not remove them from the air. It virtually eliminates stale tobacco odors, but it does not physically dissipate smoke from tobacco or other sources.

The "just noticeable" concentrations of ozone from the lamp are well within the safe limits set by the medical profession.

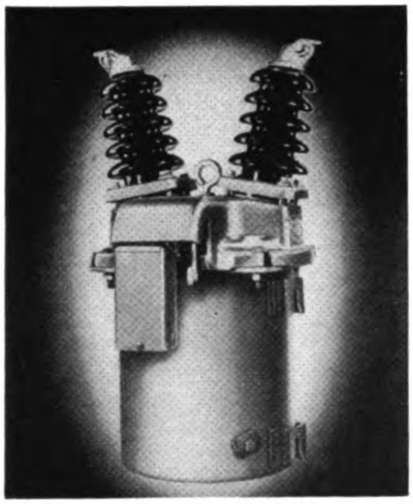


600 Ton Hydraulic Jack

According to its manufacturer, Templeton, Kenly & Co., Chicago, the world's largest tonnage hydraulic jack of its type is now available. It is the Simplex Jenny center-hole puller of 600 tons capacity.

Operated by a 10 hp. motor, it is double acting for use in large electric plants. This unit pushes or pulls in a straight line, vertically or horizontally. After desired tonnage is run up with the motor, extra tonnage can be gradually added with hand pumps.

The device incorporates two hand pumps and its center-hole principle eliminates torque. Outside diameter is 22 in., height 21 in. and 6½ in. travel is provided in the 7¾ in. center hole. Weight of unit is 1,750 lb.



Oil Switch for Pole-Mounted Capacitors

A single-pole oil switch, the type CSO-1, is available from the Westinghouse Electric Corporation. It was developed primarily for control of small banks of pole-mounted capacitors, used for power factor correction, and is also suited to the control of yard lighting circuits.

The switch can be operated manually, or electrically by an automatic control device. The operating coils are interchangeable, and provide 110-, 220-, and 440-volt control. Single-pole switches can be ganged mechanically or electrically for three-pole switching duty.

The switch has a life of 2,500 to 10,000 operations depending on the current switched. Its high momentary rating,—6,500 amp. r.m.s. asymmetrical,—permits use with extra large capacitor banks and banks in parallel on high capacity systems.

Heavy 15-kv. bushings, galvanized cast cover, drawn steel tank, and stainless steel parts are incorporated to make the switch dependable and durable.

The switch has been designed for 15 kv. and a thermal rating of 200 amp. The current rating will vary with the type of load.

◆

Plastic Safety Lenses

Development of plastic safety glasses (lenses) made in an air-conditioned room where the lenses are baked in glass molds is announced by the American Optical Co., Southbridge, Mass. These lenses are half the weight of their glass counterpart, and are resistant to breakage.

Tests have disclosed that the lenses are highly resistant to such eye hazards as splashing chemicals, welding spatter, emery wheel sparks, and the impact of hard, high velocity particles. They also resist fogging on the lens surface.

The lenses are made by combining certain chemicals with a thermo-setting liquid plastic which solidifies under heat. The mixture is placed in curved glass molds and baked under a controlled heating and time cycle.

Hand Screw Driver

A new type of hand driver with removable Phillips insert bits for driving screws with Phillips recessed heads has been made available by Continental Screw Co., New Bedford, Mass. These Hy-Pro Phillips adapter hand drivers and holders take interchangeable bits. When one wears out it can easily be removed and replaced.

A process similar to that used in cold heading the Phillips recess in screws is utilized in making the insert bits. Therefore, dimensions of both the bits and the screws are controlled by the same original master tools.

The hand-drivers, complete with removable bits, are packed six to a box. For industrial use, the bits are packaged in boxes of 100 or transparent envelopes of 25, marked for easy stock control.

They are available in four different sizes, but the No. 2 size insert bit will drive from 75 to 80 per cent of all screws with recessed type heads.

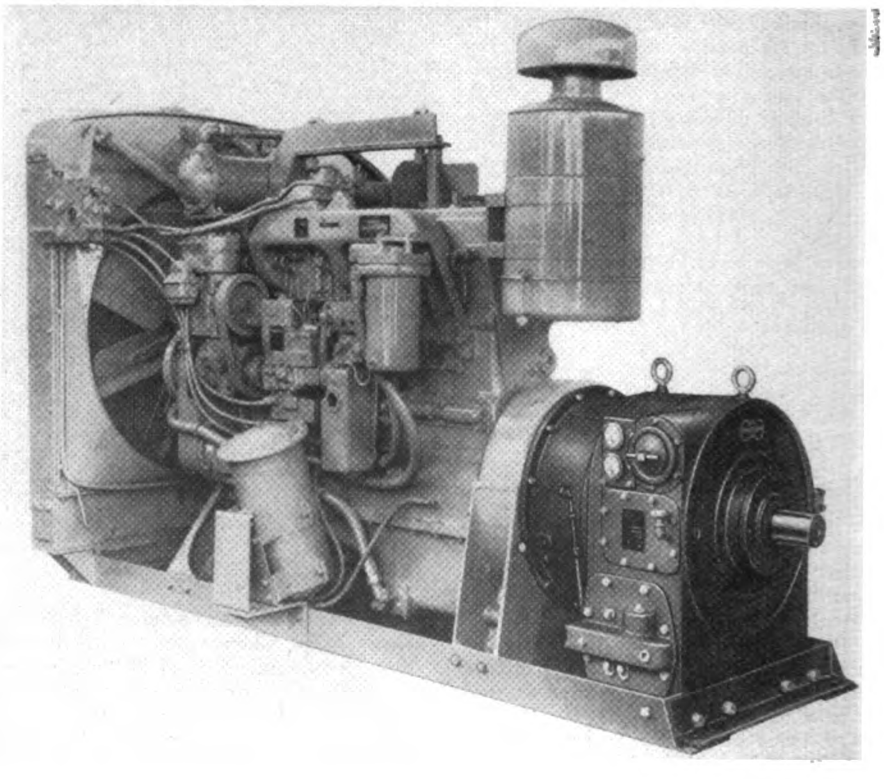
Single Stage Torque Converter

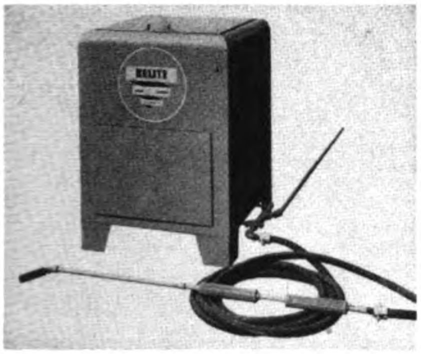
The addition of the model 17-K single-stage, three element type unit to the standard line of torque converters has been announced by the Torcon Corp., Ashtabula, Ohio. Combining a hydraulic torque converter and hydraulic coupling in a single unit, it provides automatic transmission for service equipment, locomotives, rail cars, materials handling devices such as lift trucks and front end loaders. This model can be used with gas or diesel engines rated up to 300 hp. and is roller-bearing equipped.

This converter has a variable torque ratio up to 3:1. At zero output speed, the torque multiplication is highest and this gradually decreases with increasing output speed until a point is reached where the output and input torque are equal.

Major elements of the unit consist of the converter pump, converter turbine and reaction member. Piston-ring oil seals, which contain the oil in the working elements, permit passage of a small amount of oil to provide continouous bearing lubrication.

Its chain driven circulating pump is mounted on a base plate for ease of inspection. The converter uses standard S.A.E. No. 10 motor oil and incorporates built-in oil filter, temperature and pressure gauges. It can be modified to meet the specific needs of individual applications.





High-volume fireless steam cleaner

Kelite Steam Cleaner

The high-volume fireless steam cleaner, illustrated, has been developed recently by Kelite Products, Inc., 1250 North Main street, Los Angeles 12, Calif., for efficient cleaning in the petroleum, railroad and aviation fields. The machine is offered in two models with capacities of 150 or 250 gal. per hr. With the need for fuel lines eliminated, only two connections are required for operation of the machine, one to the steam source and another to an electrical outlet. Coupled with a special caster-mounted feature, the ease of installation facilitates quick movement of the compact unit to any work area where steam cleaning is required.

A positive-action Kelite steam cleaner pump replaces the usual "syphon head" method of injecting cleaning compound into the steam line. In this way, dry steam is introduced into the gun along with precise amounts of the cleaning compound. The patented Hy-Vel nozzle concentrates the cleaning blast within a small, well-defined area—assuring maximum effectiveness and control of the cleaning operation.

Standard equipment with the fireless steam cleaner includes patented aerated gun grips, which insulate the steam gun and permit the operator to work without gloves.

◆

Wire Rope Lubricant

A wire rope lubricant—Texaco Crater A—which because of its unusual penetration and adhesion properties will permit application to wet wire rope is now being marketed by The Texas Company, New York, after extensive highly satisfactory field tests.

This product, according to the company, represents an important improvement over the product previously marketed under the same name in that it achieves greatly improved wettability while retaining the characteristics of previous Texaco Crater A.

Field tests on cables in use on dredges and cranes indicate that the compound is valuable for use in severe weather conditions, where the wire rope is wet when the lubricant is applied, or where cable is subjected to abnormal water conditions in use. Texaco Crater A will penetrate and adhere to dripping wet wire rope.

It is a thin liquid product which is applied without heating. The new product remains pliable under a wide range of atmospheric conditions. It will not drip or evaporate in hot weather. In cold weather it does not harden or chip.

◆

Waterproof Upgrading Liner

A new waterproof lining has been developed which prevents sharp objects from tearing sacked products, insulates against contamination and makes box cars grain tight.

This paper, made by the J. J. Lipp Paper Co., Chicago 7, consists of two sheets of kraft paper, cemented together with asphaltum. It is reinforced with rayon yarns or tapes and creped after lamination to give it stretching characteristics to cover obstructions and holes and to take scuffing.

The liner and tape can be used together to line an entire car and makes available freight cars and trucks that would normally be unfit for use. The process may also be used to line the floor or patch certain areas as may be needed. Two men can finish an entire floor in approximatley 15 min. It is available in 164 ft. rolls that are 62 in. wide.

Hydraulic Hose-Coupling Machine

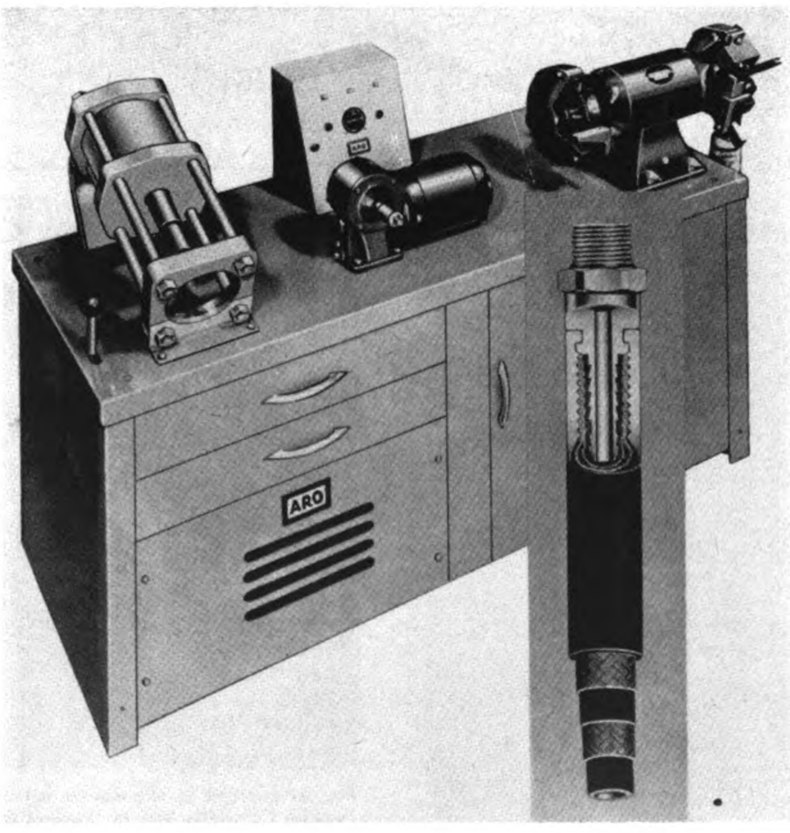
A new hydraulic hose-coupling machine for making permanent hydraulic hose assemblies has been announced by Pyles Industries, Inc., Detroit, Mich., subsidiary of The Aro Equipment Corp., Bryan, Ohio. This unit should enable users of hydraulic hose to save time, avoid delays and reduce costs by making their own hose assemblies.

This desk-size machine with a floor space of 67 in. by 29 in. performs a complete assembly and swaging job. It can produce a finished hose, coupled at both ends, in 4 min.

The machine has a cutting wheel to cut hose to length. For the next step, a wire wheel attachment is used to skive each end of the hose. Then the operator manually assembles sleeve to hose end, inserts coupling with power spinner and places coupling in the press, which swages it with one pass through the dies.

The stem of the fitting is so designed that tube stock of the hose is converted, during swaging, into a series of chevron-type packing rings for a positive seal. With the tube stock locked in place, cold flow is eliminated. These couplings are made in all sizes, with drawing dies for each size provided as standard equipment.

The unit is furnished standard for 115 volts, with 60 cycle, single phase motor.



NEWS

Rettaliata Becomes President Illinois Institute of Technology

Dr. John T. Rettaliata, vice-president and dean of engineering of the Illinois Institute of Technology, has been appointed president, succeeding Dr. Henry T. Heald, who recently resigned to become chancellor of New York University. Dr. Rettaliata will also serve as president of the institute's Armour Research Foundation and the Institute of Gas Technology.

Dr. Rettaliata, who is 40 years old, is a graduate of Baltimore Polytechnic Institute (1929). At Johns Hopkins University he received the degree of B.E. in 1932, and the degree of Dr.Eng. in 1936. During the next ten years, he worked for the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., becoming manager of the Research and Gas Turbine Development Division. He visited England on a technical mission involving jet propelled air craft and also went to Germany to investigate enemy technical developments prior to 1945 when he was appointed director of the department of mechanical engineering at Illinois Tech. He was named dean of engineering in 1948.

Dr. Rettaliata has served as consultant on gas turbines, Locomotive Development Committee, Bituminous Coal Research, Inc. He is a member of the American Society of Mechanical Engineers, and is currently serving as vice-president of Region 6, with headquarters in Chicago.

A.R.A.M. Awards Plaques for Outstanding R.R. Advertising

To the American Railway Car Institute and to the American Car & Foundry Co. went plaques awarded by the Association of Railroad Advertising Managers for "an outstanding contribution through advertising toward a better public understanding of American railroads." The institute won first prize in the association's first annual advertising competition in the field of institutional advertising; the paral-

ORDERS AND INQUIRIES FOR EQUIPMENT PLACED SINCE THE CLOSING OF THE FEBRUARY ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	No. of Units	Horse-power	Service	Builder
Erie	10[1]	1,200	Yard switch	Baldwin-Lima-Hamilton
	10[1]	1,600	Road switch for frt. service	Alco-G.E.
	6[1]	1,600	Road switch for pass. and frt. service	Alco-G.E.
	2[1]	1,000	Yard switch	Alco-G.E.
	12[1]	1,500	Road switch for frt. service	Electro-Motive
	2[1]	1,500	Road switch for pass. and frt. service	Electro-Motive
Transportation Corps.	12[2]	1,200		Baldwin-Lima-Hamilton
	83[2]	....		General-Electric
	20[2]	....		Fairbanks, Morse

FREIGHT-CAR ORDERS

Road	No. of cars	Type of car	Builder
Canadian National	100[3]	Dump	Canadian Car & Foundry
Canadian Pacific	500[4]	50-ton box	Pullman-Standard
Chicago & North Western	300[5]	70-ton ore	Bethlehem Steel
Escanaba & Lake Superior	10[6]	50-ton box	
Ford Motor Co.	100	70-ton gondola	Greenville Steel Car
Louisville & Nashville	125[7]	70-ton covered hopper	Pullman-Standard
Minneapolis, St. Paul & Sault Ste. Marie	400[8]	50-ton box	Company shops
	100[8]	50-ton hopper	Company shops
Nashville, Chattanooga & St. Louis	25[9]	70-ton covered hopper	Pullman-Standard
New York, Chicago & St. Louis	200	70-ton covered hopper	Greenville Steel Car
Transportation Corps.	965[10]	Gondola	Magor Car Corp.
	2,000[10]	Box	Pressed Steel Car
	681[10]	Gondola	Pressed Steel Car
	617[10]	Flat	Pressed Steel Car
	100[10]	Flat	Thrall Car Mfg.

FREIGHT-CAR INQUIRIES

Road	No. of cars	Type of car	Builder
Union Pacific	500	70-ton ore	
	500	70-ton hopper	
	500	70-ton gondola	
	500	50-ton box	
	500	50-ton auto-box	
	100	70-ton mill type gondola	

PASSENGER-CAR ORDERS

Road	No. of cars	Type of car	Builder
Boston & Maine	3	Rail diesel	Budd Co.
Transportation Corps.	89	Kitchen	St. Louis Car

(Continued on page 103)

Plaques awarded by the Association of Railroad Advertising Managers to the American Car & Foundry Co. (left) and to the Electro-Motive Division of General Motors Corporation (right).

ORDERS AND INQUIRIES FOR EQUIPMENT PLACED SINCE THE CLOSING OF THE FEBRUARY ISSUE—(Continued)

[1] Six of the Baldwin units are scheduled for delivery in April and four in May, while eight of the 1,600-hp. road-switchers for freight service ordered from Alco-G.E. are scheduled for delivery in August. All other units are to be delivered in the first quarter of 1953. Delivery of these units will eliminate all steam service on the Erie, except for some short-haul commuter trains in northern New Jersey. The ten units ordered from Baldwin-Lima-Hamilton are those previously reported on page 206 of the January 14 *Railway Age*.

[2] The 12 1,200 locomotives to be built by Baldwin will cost $107,538 each. The awards to G.E. include 50 locomotives at $175,800 each, and 33 at $166,630 each. All 83 are standard-gauge, 120-ton, 0-6-6-0 units, for use in foreign service. Deliveries under the contracts are expected to begin in about nine months. The 83 locomotives are a part of the 772 diesel-electrics on which the T. C. asked bids in November 1951. As to the remaining 689 units, the T. C. reports that for the time being "requirements have been withdrawn." The 20 units to be built by Fairbanks-Morse are 1,200-hp. and standard-gauge. They will cost $108,437 each. The company expects to deliver ten units by June, and the remaining ten by December 1952.

[3] Estimated cost, $900,000. Delivery scheduled for March 1953.

[4] For delivery during August and September.

[5] Estimated cost, $1,905,000. Delivery scheduled for the fourth quarter of 1952.

[6] Estimated cost, $57,000. Delivery expected next August.

[7] Estimated cost, $900,000. Delivery scheduled for fourth quarter of 1952.

[8] Delivery to depend upon receipt of necessary steel.

[9] Delivery expected during the fourth quarter of 1952.

[10] The 965 gondola cars to be built by Magor will cost $5,913 each. Rearrabgenebt if the Pressed Steel Car Company's Mt. Vernon, Ill., plant will permit manufacture of its order from the Transportation Corps concurrently with cars for domestic railroads. The flat cars to be built by Thrall will cost $4,550 each.

[11] It is expected the cars will be delivered in time to go into service with the change-of-time schedules next April 27. Two cars are of the RDC-1 type with a seating capacity of 89 and the third is an RDC-3 combination coach, baggage and mail car with a seating capacity of 49.

NOTES:

Northern Pacific.—The Northern Pacific's 1952 equipment program calls for the construction of 1,000 box cars, 200 70-ton ore cars and 50 steel cabooses at the company's Brainerd, Minn., shops. In addition, 250 gondolas will be purchased from commercial car builders.

Southern.—The Southern is asking bids on construction of 3,500 steel gondola and hopper cars. According to Harry A. DeButts, Southern president, the cars are being ordered "in anticipation of an early and favorable decision by the I. C. C. on the railroad's current petition to put into effect the full amount of the 15 per cent freight rate increase requested last March." "If that decision isn't favorable," Mr. DeButts added, "we will have to take another look at our equipment program."

Pacific Fruit Express.—Nine hundred Western Pacific refrigerator cars which have been leased to the Pacific Fruit Express Company will be completely reconstructed in P. F. E.'s Roseville (Cal.) shops, at a cost to the W. P. of $3,755,000. The cars—most of which are reaching retirement age—will be given steel frame superstructures, new electric air-circulating fans and other features to make them equivalent to new cars from the service standpoint. Difficulties in obtaining necessary materials will probably delay work until August. It is anticipated, however, that all 900 cars will be returned to service early in 1953.

lel award to A.C.F. was in the field of railroad traffic promotion. Albert W. Eckstein, retiring president of the association and advertising manager of the Illinois Central, presented the institute's award to President C. W. Wright. The similar award to A.C.F. is shown in detail. Honorable mention went to the Electro-Motive Division of General Motors Corporation in the traffic promotion field and to the General American Transportation Corporation in the institutional field.

Aydelott Has New Advisory Group on Research

A COORDINATING COMMITTEE on Physical Research has been set up in the Operations and Maintenance Department of the Association of American Railroads, to report directly to A.A.R. Vice-President J. H. Aydelott, who is in charge of the department.

In authorizing the appointment of this new committee, the board of directors of the association gave further indication of the growing importance of research to the railroad industry. Appropriations for research purposes for the year 1952 total more than a million dollars, which is the largest annual expenditure authorized thus far in support of physical research under the direction of the association's research staff.

The number of research projects to be undertaken exceeds that handled in any previous year and, as heretofore, many will be "farmed out" to outside research institutions. This year's expenditures will provide for purchase and installation of the most modern testing equipment in the association's own laboratory at Chicago and for employment of additional technicians who will conduct various research investigations in the laboratory and follow up such research projects as the association will farm out.

The new committee is composed of nine railroad officers who are leaders in their respective fields. Three were selected from the civil engineering department, three from the mechanical department, two from the test departments of the railroads, and the other from the operating department, the latter member being experienced in the field of shipping containers and packaging, the investigation and development of which is now a major activity in the new laboratory.

The new committee will screen the research programs recommended by committees of the Operating Mechanical and Engineering divisions of the association and will arrange such priority among the projects as will insure the earliest possible conclusions to be reached concerning those projects in particular which offer the greatest potential benefits or economies to the railroad industry. The committee will prepare its annual budget requirements for consideration of the board of directors and member lines, and will include such

(*Continued on page 104*)

SUMMARY OF MONTHLY HOT BOX REPORTS

Month	Foreign and system freight car mileage (Total)	Cars set off between division terminals account hot boxes: System	Foreign	Total	Miles per hot box car set off between division terminals
July, 1950	2,745,932,894	....	....	23,957	114,619
August, 1950	2,937,455,020	7,422	15,490	22,912	128,206
September, 1950	2,974,297,739	6,541	12,881	19,422	153,141
October, 1950	3,165,997,915	4,343	8,935	13,278	238,439
November, 1950	2,868,871,913	2,536	5,331	7,867	364,672
December, 1950	2,813,042,212	2,278	5,968	8,246	341,140
January, 1951	2,840,847,511	2,870	8,436	11,306	251,269
February, 1951	2,425,226,454	4,528	14,063	18,591	130,452
March, 1951	3,063,173,942	3,667	10,078	13,745	222,857
April, 1951	2,996,562,763	3,702	8,914	12,616	237,521
May, 1951	3,013,634,782	5,631	13,737	193,368	155,599
June, 1951	2,874,873,495	7,074	15,376	22,450	128,057
July, 1951	2,768,920,095	8,886	18,823	27,709	99,929
August, 1951	3,009,371,111	9,023	19,092	28,115	107,038
September, 1951	2,925,570,545	6,472	13,565	20,037	146,008
October, 1951	3,116,490,095	4,131	9,053	13,184	236,384

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I. C. C. M-211 AND M-240)

Item No.		Month of October 1951	Month of October 1950	10 months ended with October 1951	10 months ended with October 1950
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	24,371	32,308	252,221	288,811
3-06	Total, Diesel-electric	25,455	19,813	224,193	172,503
3-07	Total, electric	833	902	8,142	8,289
3-04	Total, locomotive-miles	50,660	53,035	484,578	469,660
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,857	1,909	17,318	16,229
4-06	Empty, total	951	941	8,805	8,459
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	44,847	56,875	443,120	482,043
6-02	Total in oil-burning steam locomotive trains	12,040	15,257	120,343	128,381
6-03	Total in Diesel-electric locomotive trains	71,830	56,978	627,593	489,880
6-04	Total in electric locomotive trains	2,277	2,493	22,304	22,071
6-06	Total in all trains	131,004	131,657	1,213,488	1,122,640
10	Average per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.04	1.05	1.04	1.05
10-02	Loaded freight car-miles	40.50	40.20	39.60	38.60
10-03	Empty freight car-miles	20.80	19.80	20.20	20.20
10-04	Total freight car-miles (excluding caboose)	61.30	60.00	59.80	58.80
10-05	Gross ton-miles (excluding locomotive and tender)	2,861	2,774	2,780	2,672
10-06	Net ton-miles	1,350	1,306	1,305	1,221
12	Net ton-miles per loaded car-mile (M-211)	33.30	32.50	32.90	31.60
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	66.10	67.00	66.30	65.70
14	Averages per train hour (M-211):				
14-01	Train miles	16.80	16.60	16.90	16.90
14-02	Gross ton-miles (excluding locomotive and tender)	47,469	45,317	46,435	44,525
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	48.60	49.90	46.20	45.20
14-02	All	46.30	47.30	44.10	42.30
15	Average net ton-miles per freight car-day (000) (M-240)	1,019	1,028	961	879
17	Per cent of home cars of total freight cars on the line (M-240)	36.70	35.60	37.10	41.70

(*Continued on page 104*)

SELECTED MOTOR POWER AND CAR PERFORMANCE STATISTICS (continued)

	Passenger Service (Data from I. C. C. M-213)				
3	Road motive-power miles (000):				
3-05	Steam	8,517	11,792	101,013	117,072
3-06	Diesel-electric	17,466	15,476	163,146	145,712
3-07	Electric	1,606	1,623	16,177	16,033
3-04	Total	27,589	28,891	280,336	278,817
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	269,711	278,188	2,732,448	2,686,421
4-09	Total in coal-burning steam locomotive trains	44,577	63,050	529,379	604,754
4-10	Total in oil-burning steam locomotive trains	28,924	36,677	327,172	368,966
4-11	Total in Diesel-electric locomotive trains	178,488	160,947	1,702,489	1,540,159
12	Total car-miles per train-miles	9.56	9.45	9.58	9.44
	Yard Service (Data from I. C. C. M-215)				
1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	1,141	1,541	12,089	14,230
1-02	Steam, oil-burning	244	298	2,380	2,478
1-03	Diesel-electric[1]	3,177	2,822	29,473	24,839
1-06	Total	4,588	4,692	44,198	41,820
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	38	53	459	581
2-02	Steam, oil-burning	13	15	130	134
2-03	Diesel-electric[1]	248	241	2,419	2,278
2-06	Total	333	345	3,343	3,334
3	Hours per yard locomotive-day:				
3-01	Steam	7.80	9.00	7.80	8.00
3-02	Diesel-electric	17.30	18.10	17.20	17.40
3-05	Serviceable	14.80	15.00	14.40	14.10
3-06	All locomotives (serviceable, unserviceable and stored)	12.70	13.00	12.40	11.90
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.72	1.71	1.76	1.78
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.77	0.77	0.76	0.77

[1] Excludes B and trailing A units.

(*Continued from page 103*)

recommendations as to the expansion of staff, facilities and equipment as the situation may call for.

Membership on the committee is territorially representative and the chairman will be selected from among members under a plan of rotation. The chairman selected for the year 1952 is Tom A. Blair, chief engineer, Atchison, Topeka & Santa Fe, who is the engineering department representative from western railroads. Other members of the committee are as follows: Representing eastern railroads—Frank K. Mitchell, manager of equipment, New York Central; Samuel R. Hursh, assistant chief engineer, Pennsylvania; Russell W. Seniff, engineer of tests, Baltimore & Ohio; representing southeastern railroads—Harry C. Wyatt, assistant general superintendent, motive power, Norfolk & Western; Charles H. Mottier, vice-president and chief engineer, Illinois Central; J. Rowland Formby, assistant to vice-president (operations), Southern. In addition to Mr. Blair, western representatives are Max C. Haber, general mechanical engineer, Union Pacific, and Robert E. Coughlan, chief metallurgist and engineer of tests, Chicago & North Western.

SUPPLY TRADE NOTES

General Steel Castings Corporation.—*Pierre O. Wood* has been appointed manager of service for the General Steel Castings Corporation, Granite City, Ill., succeeding *W. J. Taylor,* retired. A photograph of Mr. Wood and a sketch of his career appeared in the May 1951 issue, page 102.

◆

Joseph T. Ryerson & Son.—A plan to get stagnant steel and idle equipment into active use, or else disposed of as scrap, has been announced by Joseph T. Ryerson & Son. To help steel users dispose of items they are willing to sell, Ryerson is offering to publish, without charge, classified advertisements in its company newspaper, which is circulated nationally to more than 100,000 firms in all lines of business. The program is designed to provide a medium of exchange between users of steel products, making steel and steel equipment that may be lying dormant in one location available to potential users elsewhere. The plan, the announcement says, "approaches the scrap problem from another angle," in that it "is aimed primarily at prying loose unused steel and equipment and getting it into use, or if it is found to be unusable, getting it scrapped."

◆

Elwell-Parker Electric Company.—The Elwell-Parker Electric Company, Cleveland, Ohio, have appointed the *Gogerty-Reynolds Supply Company,* 619 National Bank building, Omaha 2, Neb., to handle sales of their trucks and cranes to railroads operating out of Omaha.

John Gogerty recently retired as general superintendent of motive power and machinery for the Union Pacific at Omaha, Neb.

FAIRBANKS-MORSE APPOINTMENTS

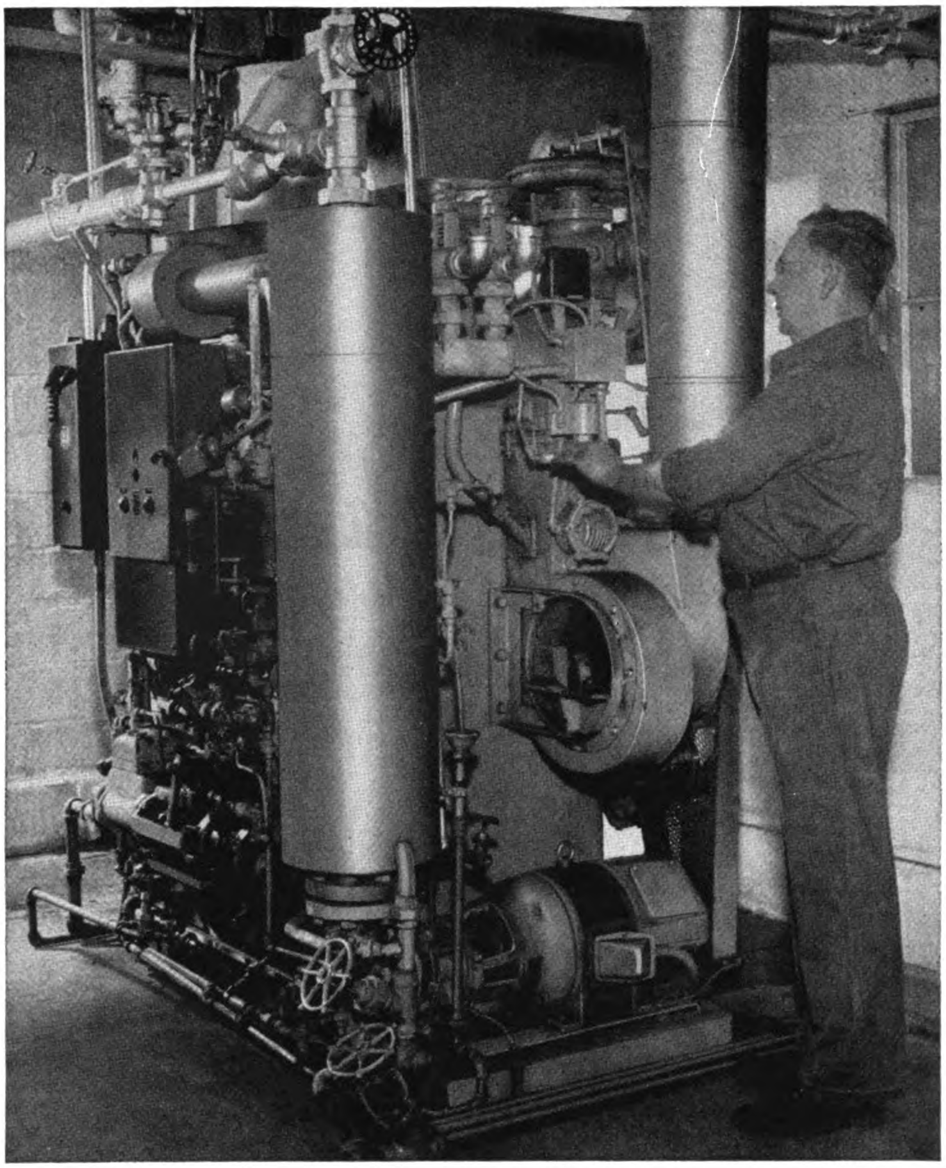
J. A. Cuneo

Milo C. Roy

J. W. Wright

C. E. Dietle

J. A. Cuneo, manager of the Chicago branch of Fairbanks, Morse & Co., has been appointed to general sales manager; *Milo C. Roy,* formerly manager of the Omaha branch, has been appointed manager of the Chicago branch; *J. W. Wright,* for-



Why not- generate steam *where you use it?*

You buy a boiler 15 or 20 feet square (or more) and just as high, and chances are you don't have room to install it very near to the places — often widely separated — where steam is to be used. So what do you do? You install, insulate and maintain expensive steam lines from the place the steam is produced to its point of use and then you continue to pay for inevitable condensation losses which can only mean higher steam costs.

Why?

Well, for one reason — some situations may make that the only practical way to do the job. *But* — in a great many instances you'll make a big saving in time, space and money by selecting the Elesco Re-circulation Steam Generator — the unit that permits you to generate steam *where* you *use* it.

If you have a space 7 feet square and about that high, that's all you need to set up the Elesco Re-circulation Steam Generator. It's more than a "package" boiler — it's a complete steam plant including all controls and auxiliaries — a fully integrated unit — generating up to 6,000 pounds of steam per hour.

So — if you need steam . . . for continuous or intermittent load . . . for heating or power — or both . . . for a location in your plant not now served by your existing boiler plant . . . for an occasional demand which exceeds the capacity of present boilers — if you want any or all of these, plus the advantages of maximum output from minimum space, then your best bet is the Elesco Re-circulation Steam Generator. Don't buy any boiler in its capacity range until you investigate Elesco.

ELESCO

THE SUPERHEATER COMPANY, INC.

Division of COMBUSTION ENGINEERING-SUPERHEATER, INC.

200 MADISON AVE.
NEW YORK

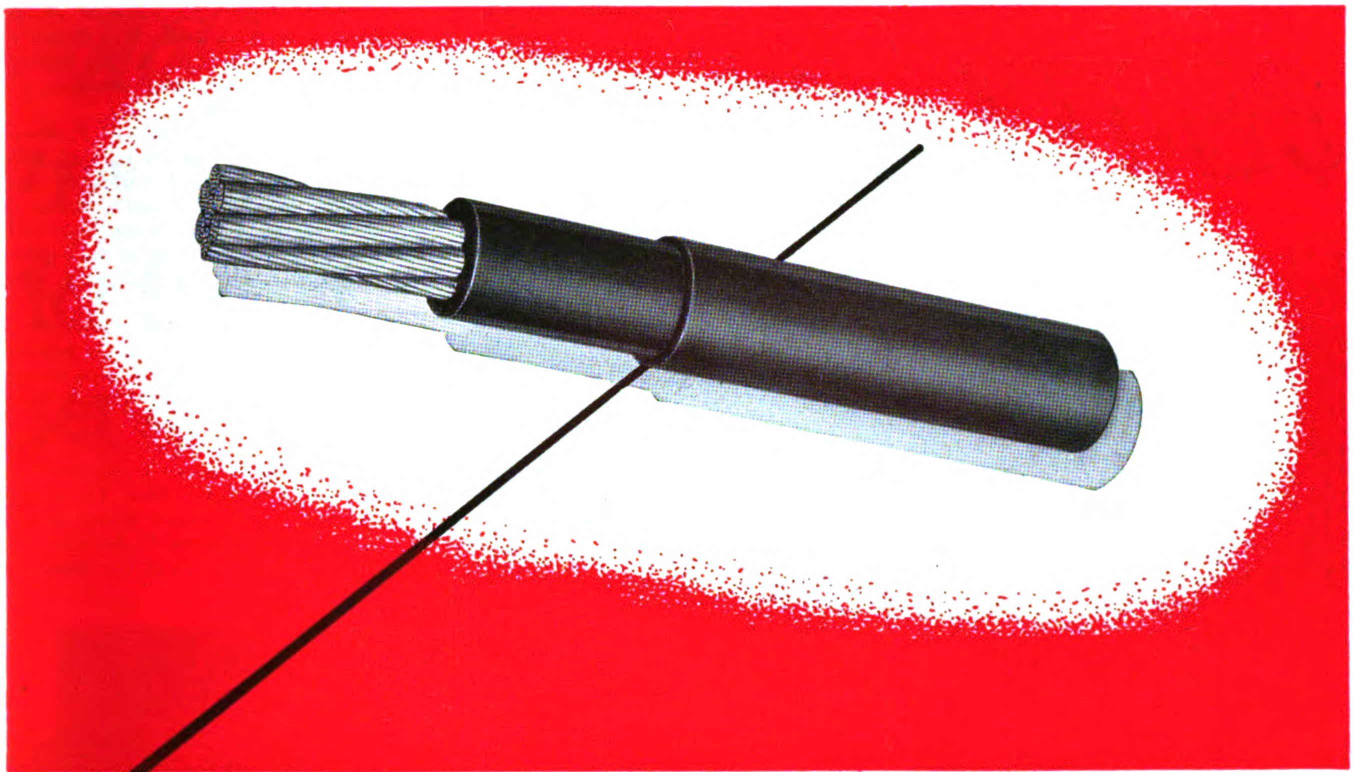
BANKERS BUILDING
CHICAGO

W. B. Wylly

L. A. Weom

Clifford J. Schroeer

merly manager of the Diesel Sales division, with headquarters in Chicago, has been appointed manager of the Omaha branch; *C. E. Dietle*, formerly diesel department manager of the Chicago branch, has been promoted to manager of the Diesel Sales division. *W. B. Wylly*, formerly manager of the Houston, Tex., sub-branch, is now manager of the Atlanta branch. *L. A. Weom*, formerly St. Louis branch manager, has been transferred to St. Paul, where he assumed the duties of branch manager to succeed *A. C. Thompson*, who has retired after 45 years of service. *Clifford J. Schroeer*, for-



There's Double Satisfaction in this car wire.

Yes, when you specify Simplex-Anhydroprene Wires for car lighting, heating, and air conditioning circuits, you'll smile, and so, too, will your passengers.

You'll acclaim their low cost, dependable performance, and long life. Your passengers will cheer the constant "at-home" comfort their failure-free operation provides. All spell p-r-o-f-i-t for you.

Insulated with Anhydrex and jacketed with a thin — but tough — wall of neoprene, Anhydroprene wires combine stable electrical properties with effective resistance to water and moisture, oils, grease, acids, heat and flame. They have no outer braids to fray and rot and hold in moisture. They are not harmed by vibration or by stray electrical currents. Their light weight, small diameter, and flexibility assure fast, easy installation, and their smooth jacket surface permits pulling through conduits without the use of lubricants.

Anhydroprene Wires are also ideal for diesel wiring and shop wiring, and for power and lighting circuits in yards and stations when the circuits are installed in ducts. If you would like a sample of this top-quality, low-cost wire, plus detailed information, simply fill in and return the coupon below to the Simplex Railroad Department.

SIMPLEX

WIRES AND CABLES

SIMPLEX WIRE & CABLE CO.

79 Sidney St., Cambridge 39, Massachusetts

SIMPLEX WIRE AND CABLE CO.
RAILROAD SALES DEPARTMENT
79 SIDNEY ST., CAMBRIDGE 39, MASS.
GENTLEMEN: PLEASE SEND SAMPLE AND BULLETIN 115 TO:

NAME__________ TITLE__________

COMPANY__________

STREET__________

CITY__________ STATE__________

merly diesel department manager of the St. Louis branch succeeds Mr. Weom as manager of the branch. *H. L. Hilleary* continues as assistant sales manager.

◆

GUILFORD S. TURNER, INC.—*E. P. Moses* has been appointed eastern railroad sales representative of Guilford S. Turner, Inc., of Chicago. Mr. Moses recently retired as engineer, car equipment, of the New York Central (*Railway Mechanical and Electrical Engineer*, January 1952, page 110).

◆

ELECTRIC STORAGE BATTERY COMPANY.—*S. Wyman Rolph*, president of the Electric Storage Battery Company, has been elected president of the Franklin Institute.

◆

AMERICAN BRAKE SHOE COMPANY.—*Fred P. Biggs* has been elected a vice-president of the American Brake Shoe. He also is president of the company's Brake Shoe & Castings division. *Edward R. Anderson* has been appointed president of the American Forge division.

Fred P. Biggs

Mr. Biggs joined the company in 1916 and was designated vice-president in charge of sales for both Brake Shoe & Castings and Southern Wheel divisions in 1944. He was elected president of the Brake Shoe and Castings division in 1950.

◆

SUNDSTRAND MACHINE TOOL COMPANY.—*Robert N. Nelson*, formerly assistant sales manager, has been appointed sales manager of the Pneumatic division of the Sundstrand Machine Tool Company, Rockford, Ill.

◆

GOULD-NATIONAL BATTERIES, INC.—*Willard C. Shull* has been appointed special assistant to the president of Gould-National Batteries, Inc., with headquarters at St. Paul. Mr. Schull has been assistant general sales manager, brand sales, for the past two years.

◆

WALWORTH COMPANY.—*Alfred J. Eichler* has been appointed president and chairman of the Executive Committee of the Walworth Company at 60 East 42nd street, New York 17.

◆

TAYLOR FIBRE COMPANY.—The Taylor Fibre Company, with main offices in Norristown, Pa., and La Verne, Calif., has opened a new district office at 822 Wood street, Pittsburgh 21. *W. H. Slocum* is district manager of the new office.

YOUNGSTOWN SHEET & TUBE CO.—*James A. Hale* has been appointed district sales manager in charge of the Cleveland office of the Youngstown Sheet & Tube Co., succeeding the late *F. A. Olmstead.*

◆

BENDIX AVIATION CORPORATION.—*Lewis J. Garday* has been appointed chief engineer of diesel fuel injection equipment for the *Scintilla Magneto division* of the Bendix Aviation Corporation, Sidney, N. Y. Mr. Garday was recently associated with

Louis J. Garday

Busch-Sulzer Bros., diesel engine division of the Nordberg Manufacturing Company, as consulting engineer on combustion and fuel injection problems. He was formerly chief engineer of the Aircraft & Diesel Equipment Corp. of Chicago.

◆

CONTINENTAL-DIAMOND FIBRE COMPANY.—*Gerald Knox Swallow* has been appointed sales manager of railroad products for the Continental-Diamond Fibre Company of Newark, Del. Mr. Swallow, who has been

G. K. Swallow

with the company since 1919, will head the firm's railway sales representatives and will be responsible for developing new railroad applications for fibre laminated and molded plastics, and Teflon insulating materials.

◆

MARS SIGNAL LIGHT COMPANY.—*Lynne L. White, Jr.,* has been appointed general manager of the Mars Signal Light Company, Chicago. A graduate of Dartmouth college, Mr. White has been with the Mars organization since 1948.

(*Continued on page 114*)

for anti-wear performance

An advance in railroad diesel lubrication that rivals the discovery of anti-sludge compounds!

SHELL TALONA R OIL 40 combats the main causes of diesel engine wear so successfully that accepted wear standards must now be revised. *This gain is achieved without sacrifice of any basic lubricating function.*

Especially favorable is the wear reduction at the critical top-cylinder zone. By maintaining original cylinder-wall and piston-ring dimensions longer, engine efficiency stays at a high level and crankcase contamination is greatly reduced.

Investigate the anti-wear advantages of Shell Talona R Oil 40 for *your own* diesel units.

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100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA
SHELL BUILDING, ST. LOUIS 3, MISSOURI

SHELL®

(Continued from page 110)

Armco Steel Corporation.—*H. M. Arrick* has been appointed district sales manager in St. Louis for the Armco Steel Corporation, succeeding *N. L. Pierson* who is retiring.

Mr. Arrick, a graduate of the University of Illinois, began his association with Armco in 1927 as a sales engineer in Middletown, Ohio. He was district sales manager at St. Louis for a subsidiary company of Armco from 1937 until 1945. At that time, the subsidiary organization became a part of the parent company and Arrick became assistant district sales manager.

◆

Standard Railway Equipment Manufacturing Company.—*W. E. Bikle* has returned to the Standard Railway Equipment Manufacturing Company as assistant vice-president at Chicago, after being on loan to the Railroad Equipment Division of the National Production Authority. Before going to Washington, Mr. Bikle was assistant vice-president of Standard at New York. He has been with Standard and its predecessors since 1921. *Dean C. Webster* has been appointed assistant vice-president of the Standard Railway Equipment, with headquarters in New York. Mr. Webster, who will have responsibility in Eastern and Southeastern districts for all mechanical and engineering matters dealing with Standard and its customers, became assistant chief engineer of Standard Railway in 1946. He was previously with the Pacific Fruit Express Company.

W. E. Bikle

Dean C. Webster

P-W SPECIALTIES CORPORATION. — The P-W Specialties Corporation, Chicago, has appointed the following sales representatives for the Klasing automatic slack adjuster: *S. W. Sargent*, Philadelphia; *Henry W. Stahl*, New York; *Harry E. Hyslop*, president of the Hyslop Brothers, Inc., Chicago; *Clyde Hyslop*, western sales manager, Hyslop Brothers, Inc., San Marino, Cal.; and *Harry P. Kelker*, manager of Walter E. Day, San Francisco.

◆

UNITED STATES STEEL COMPANY.—*Clyde B. Colwell, Jr.*, has been appointed district manager for the Twin Cities (Minn.) district of the United States Steel Supply division of the United States Steel Company. He succeeds the late *John K. Rittenhouse*.

W. W. Deal

W. W. Deal, Philadelphia district sales manager for the *American Steel & Wire division* of the United States Steel Company for the the past 21 years, has been appointed manager of the New York district sales office, to replace the late *W. E. Mackley*. *L. L. Anderson*, assistant manager of sales at Philadelphia since 1937, has been appointed manager. *R. W. Drake*, manager of sales at Wilkes-Barre, Pa., since 1947, has been transferred to Philadelphia as assistant manager of sales.

◆

PYLE-NATIONAL COMPANY.—The Pyle-National Company has moved its San Francisco offices to 593 Market street, San Francisco 5.

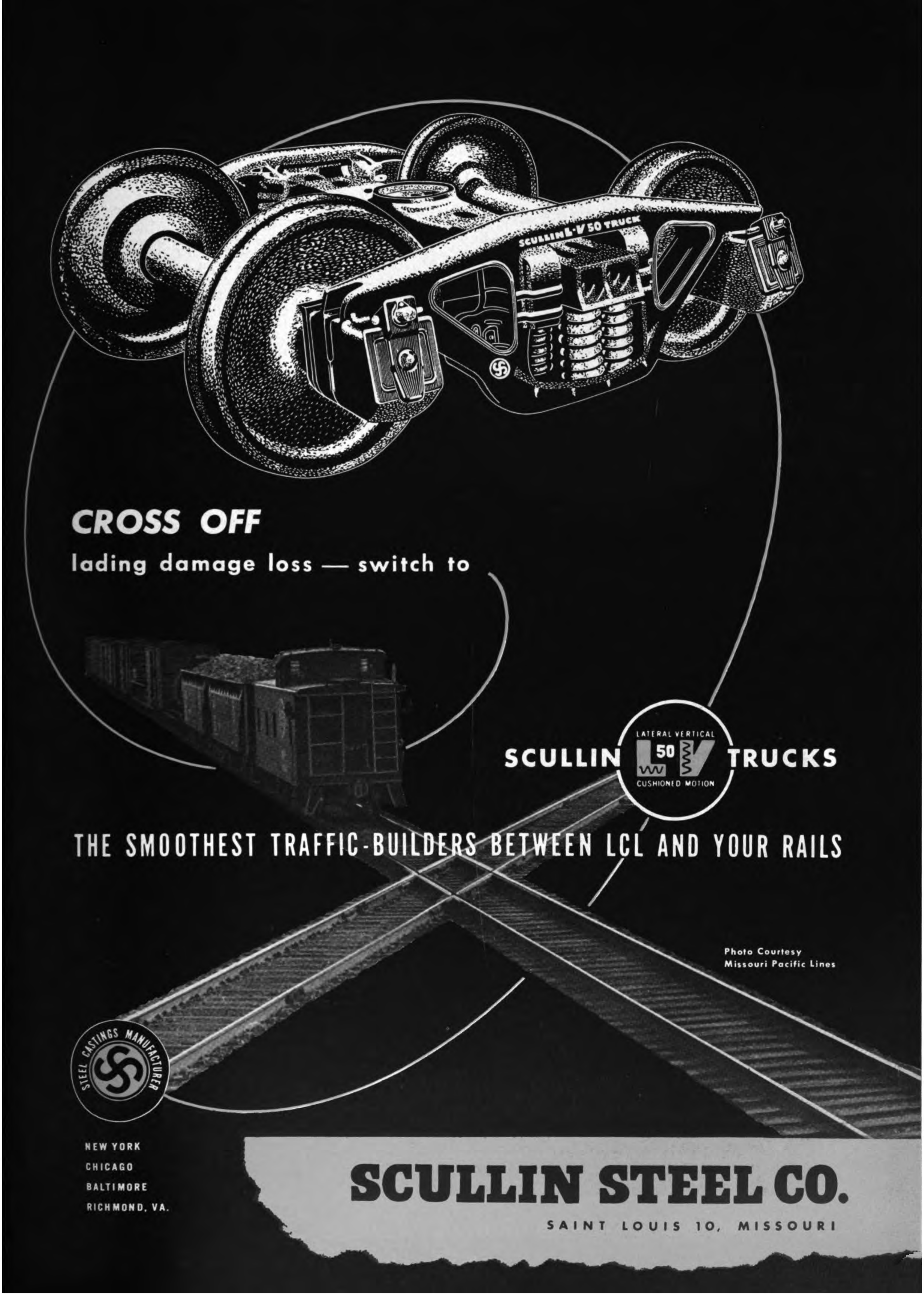
◆

DETREX CORPORATION.—*Alan H. Harris* has been appointed products manager of the Phosphate Coating Division of the Detrex Corporation, Detroit 32.

◆

DEARBORN CHEMICAL COMPANY.—*E. M. Converse*, senior vice-president of the Dearborn Chemical Company, Chicago, has retired, but will continue to serve the company "as necessary." *H. G. Mastin* has been appointed assistant to the vice-president of the Eastern railroad division of Dearborn. Mr. Mastin will be in charge of railroad sales and service in the New England area. *N. E. Cornell*, formerly with the New York Central, has joined Dearborn and will work with Mr. Mastin as a service engineer.

Mr. Converse joined Dearborn in 1902. He worked in the laboratory until 1908, when he was transferred to the sales department as water treatment engineer at



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LATERAL VERTICAL
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CUSHIONED MOTION
TRUCKS
THE SMOOTHEST TRAFFIC-BUILDERS BETWEEN LCL AND YOUR RAILS
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STEEL CASTINGS MANUFACTURER
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SAINT LOUIS 10, MISSOURI

Chicago. In 1918 he was appointed director of the specialty department. He became a director of the company in 1929 and in the following year was named also industrial department manager, coincidentally with the merging of the industrial product divisions under one department. In 1934 he was elected vice-president and in 1949 was given the title of senior vice-president.

◆

WESTINGHOUSE ELECTRIC CORPORATION.—*C. F. Sponsler*, application engineer in the transportation department of the Westinghouse Electric Corporation since 1942, has been appointed manager of the land transportation section of the department, succeeding *H. H. Hanft*, recently appointed assistant to manager of the industrial department.

Mr. Sponsler, a graduate of Haverford College in 1938 with a B.S. degree in engineering, joined the Westinghouse graduate student training course in 1939 and, until 1942, was in the transportation application engineering department of the transportation and generator division.

◆

BALDWIN-LIMA-HAMILTON CORPORATION.—The *Niles Tool Works Company*, division of the Baldwin-Lima-Hamilton Corporation, has appointed *D. C. Weiss* as sales representative in western Pennsylvania, eastern Ohio, and West Virginia, with headquarters at Pittsburgh. Mr. Weiss formerly was at the Hamilton, Ohio, plant.

◆

HUNT-SPILLER MANUFACTURING CORPORATION.—*K. A. Craig* and *P. W. Lampton*, representatives of the Hunt-Spiller Manufacturing Corporation, Boston 27, since February 1, 1940, and November 4, 1942, respectively, have been appointed assistant sales managers.

◆

PENNSYLVANIA SALT MANUFACTURING COMPANY.—*Sharples Chemicals, Inc.*, has been combined with the Pennsylvania Salt Company through an exchange of common stock. For the present the latter company will continue to operate as a separate unit of Pennsalt, with an exchange of technical information and co-ordination of policies.

◆

AMERICAN LUMBER & TREATING CO.—*Herbert W. Angell* has been appointed technical director of the American Lumber & Treating Co., Chicago. He will assume responsibility for management of its technical department, laboratory and licensee quality-control. Mr. Angell has been a member of the company's technical staff for the past 13 years.

◆

GENERAL MOTORS DIESEL, LTD.—*E. V. Rippingille, Jr.*, president and general manager of General Motors Diesel, Ltd., London, Ont., has been loaned to the Canadian government as director of the Aircraft Division of Canada's Defense Production Department. Mr. Rippingille will continue as president of G.M.D., while *John W. Brophy*, formerly director of production control and purchasing, has been appointed acting general manager.

◆

J. H. WILLIAMS & CO.—*Michael J. Kearins* has been elected president of J. H. Williams & Co., Buffalo, succeeding *A. D. Armitage*, who becomes chairman of the board, a newly created position. *John B.*

ESSO COBLAX

"Tailor-made" to railroad specifications

The Sign of QUALITY

Esso

The Symbol of SERVICE

RAILROAD PRODUCTS

SOLD IN: Maine, N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Penna., Del., Md., D. C., Va., W. Va., N. C., S. C., Tenn., Ark., La.

ESSO STANDARD OIL COMPANY — Boston, Mass. — New York, N. Y. — Elizabeth, N. J. — Philadelphia, Pa. — Baltimore, Md. — Richmond, Va. — Charleston, W. Va. — Charlotte, N. C. — Columbia, S. C. Memphis, Tenn. — New Orleans, La.

ESSO COBLAX LUBRICANTS

have been specifically developed to provide highly dependable gear lubrication for traction motor drives on electric and diesel-electric locomotives; gas electric and multiple-unit cars; and many other locomotive and car lubrication requirements. Esso COBLAX is available in a wide range from fluid oils to semi-solid products... "tailor-made" for railroad applications.

BACKED BY CONSTANT RESEARCH

— keeping pace with latest engine design and developments. Esso Railroad Products are constantly being tested and improved.

BACKED BY CONSTANT FOLLOW-UP

— on-the-job check ups by Esso Sales Engineers assure dependable performance of Esso Railroad fuels and lubricants! Be sure to call on ESSO for any fuel or lubricating problem.

Perkins has become vice-president in charge of sales, succeeding *E. J. Wilcox*, who retired on March 1 after 46 years of service.

◆

Simplex Wire & Cable Co.—*John M. Murray* has been appointed assistant sales manager of the Simplex Wire & Cable Co.

Mr. Murray joined Simplex in 1928 after graduation from Northeastern University. He worked first in the electrical research laboratory, transferring subsequently to the engineering and the sales departments.

◆

Inland Steel Company.—*John F. Smith, Jr.*, general manager of sales of Inland Steel, has been elected vice-president in charge of sales, succeeding *Joseph L. Block*, who has been elected executive vice-president and chairman of the finance committee.

◆

Baker-Raulang Company.—*John A. Borman* has been appointed chief engineer of the Baker-Raulang Company.

Emory N. Mumma, district representative for the Baker-Raulang Company, at Philadelphia, has opened a branch office at 100 South Gay street, Baltimore. *Edward G. Mathew* is manager of the new office.

W. T. Billard, Inc., 734 East Third street, Los Angeles 13, has been appointed representative in southern California and Arizona for the *Baker-Raulang Company*, to handle all sales, service and field engineering in that territory.

◆

General Motors Corporation.—*Thomas C. Renner*, formerly of the railroad journal box design section of the Hyatt Bearings division of General Motors Corporation, Harrison, N. J., has been transferred to the Chicago office to handle railroad service work in that territory.

Obituary

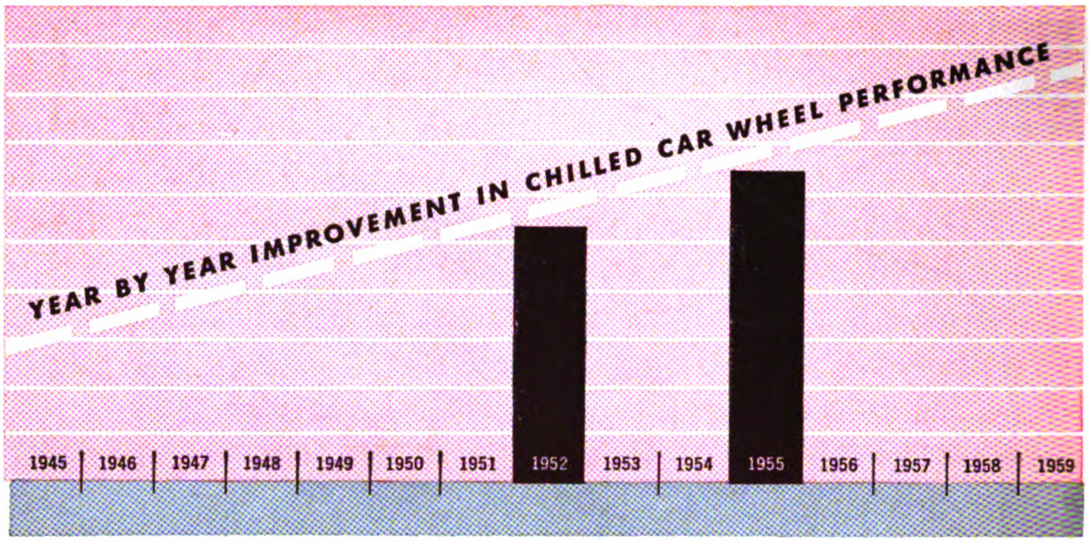
B. A. Dollens, vice-president of General Motors Corporation and general manager of its Electro-Motive Division, died at Hinsdale, Ill., on February 9, at the age of 50. He had been hospitalized since February 4, when he suffered a cerebral hemorrhage. Mr. Dollens had just completed several months' work in Washington, D. C., where he had helped to present facts on behalf of the locomotive building industry's effort to secure reasonable allocations of steel and other essential materials.

Mr. Dollens was a graduate of Purdue University where he received the degree of Bachelor of Science in Mechanical Engineering in 1925 and an honorary degree of Doctor of Science in Mechanical Engineering in June 1951. He entered the employ of the Remy Electric Company (now Delco-Remy) at Anderson, Ind., and advanced through this division of the General Motors organization until February 1944, when he became manager of the corporation's battery operations and foundries. On July 1, 1945, he became general manager of the Saginaw Malleable Iron Division at Saginaw, Mich. He became associated with Electro-Motive in November 1946, as assistant general manager, and was appointed general manager in August 1950. Simultaneously he was elected a vice-president of G.M.

B. A. Dollens

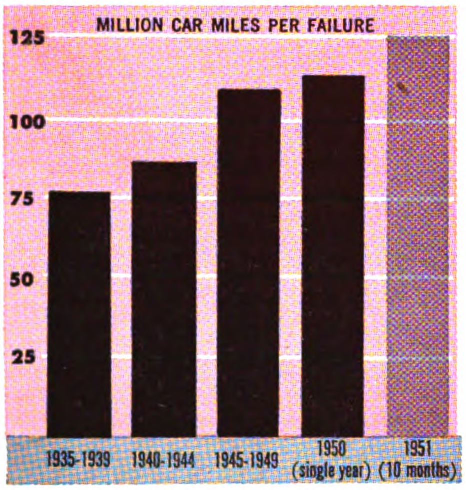
Herbert I. Dunphy, assistant vice-president of American Car & Foundry Co., whose death was reported in the February issue, was educated in New York City schools. He served with the New York Central and from 1918 to 1920 was chief

(*Continued on page 126*)



See chart below for official record covering the years 1935-1951.

how to get 1955 performance today



AMCCW WHEEL PERFORMANCE PER MILLION CAR MILES

AMCCW wheel safety performance as measured by millions of car miles to each failure, based on ICC reports. Latest official figure: 1950, with one failure in 113,000,000 car miles; and still better for the first 10 months of 1951.

Strange thing about chilled car wheels. We make an improvement, say in 1941, and the records show better performance along about five years later.

Take the increase in rim thickness in 1945, for instance. It was one of the factors, certainly, in reducing the percentage of wheels removed from service for chipped and broken rims from 15% in 1945 to 8% in 1950 and '51. That's the way it goes when a product stays in service from 7 to 12 years.

A major improvement in AMCCW wheels was made official in 1950, when the AAR accepted the design with stronger flange and rim, and with thicker and heavier brackets.

Hundreds of thousands of these wheels are already in service, giving better performance. But official records are based on *all* chilled wheels in service—something over 10,000,000. It will take another three or four years—maybe more—for the new wheels to lift *average* performance appreciably. (Meanwhile pre-1950 AMCCW wheels are showing better performance records than *their* predecessors, making for continuous improvement in service records.)

One thing is sure: the AMCCW wheels you put under your freight cars today will give you this 1955 performance immediately . . . will put your wheels ahead of the average.

Tests on the new standard wheel show 100% improvement in rim strength, because of heavier tread on rim side. More brackets give thicker, heavier, more continuous support to flange. This wheel received AAR approval September 1, 1950, is now giving improved performance that will be statistically proved along about 1955.

In good supply
Available locally
Short-haul delivery
Reduced inventory
Low first cost
Low exchange cost
Increased ton mileage
High safety standards
AMCCW plant inspection
Easier shop handling

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

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Albany Car Wheel Co. • American Car & Foundry Co.
Griffin Wheel Co. • Marshall Car Wheel & Foundry Co.
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Here's the *practical, sensible* answer to your rust problems! Costly sandblasting or chemical pre-cleaning are not usually required . . . just wire-brush and scrape to remove rust scale and loose particles . . . then apply RUST-OLEUM by brush, dip, or spray over the rusted surface. Dries to a tough, elastic, rust-resisting film that lasts longer applied over rusted areas. So easy to use that one man often does the work of two . . . saves you time, labor, and money. Get the complete story from your RUST-OLEUM Rust Preventive Railroad Specialist today!

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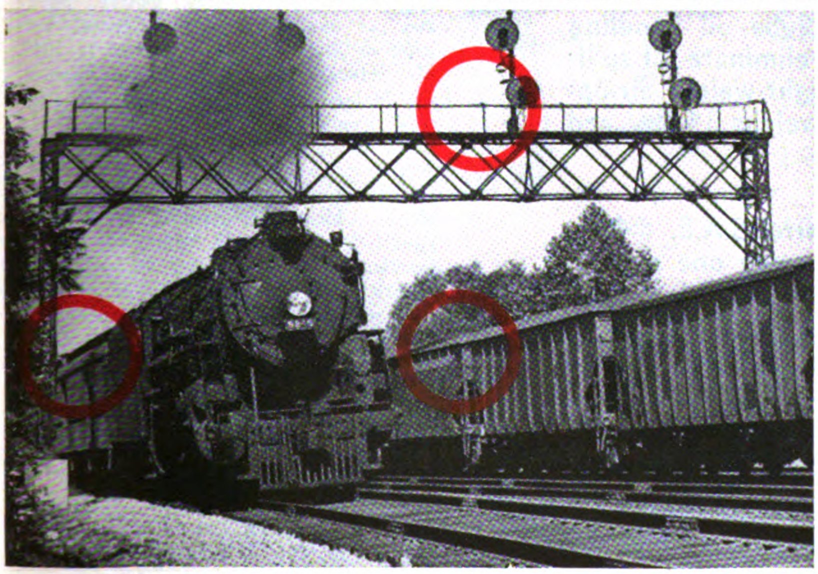

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administrative secretary of the U. S. Ordnance Department. He became associated with American Car & Foundry in May 1920 in the New York sales department and was appointed assistant vice-president of sales in December 1936. Mr. Dunphy was a member of the New York Railroad Club and the Canadian Railway Club.

Kenneth Andrew, 68, assistant sales manager of the Baldwin-Lima-Hamilton Corporation, at Eddystone, Pa., died on January 21.

Edwin F. Lankes, eastern region supervisor of the Detrex Corporation, died on January 22.

PERSONAL MENTION

General

J. E. Goodwin, vice-president of the Chicago & North Western, has been appointed vice-president in charge of operations. Mr. Goodwin has been in railroad service since 1918, beginning as a machinist apprentice on the Santa Fe, where he served until 1922, when he joined the Missouri Pacific as machinist. In 1927 he became enginehouse foreman, and subsequently served as erecting foreman, schedule supervisor, production engineer and general foreman. In 1939 he was named acting shop superintendent, and in 1941 became master mechanic of the International-Great Northern. He returned to the M.P. as mechanical superintendent in 1942 and in 1943 became assistant chief mechanical officer of the C. & N. W. He was appointed chief mechanical officer in 1945, and vice-president in 1948.

Arthur Selbee, who has been appointed general superintendent of motive power and car equipment of the Grand Trunk Western, with headquarters at Battle Creek, Mich., as announced in the January issue, was born on September 25, 1892, in Climax, Mich. He received his education at the Lincoln Institute of Technology and Battle Creek College and entered railroad service in 1910 as an apprentice on the Grand Trunk Western. He was later locomotive inspector, gang foreman, enginehouse foreman, departmental foreman in locomotive shops, and shop superintendent. For 18 years, intermittently, he was employed by the Baldwin Locomotive Works, the American Lomotive Company, and the Lima Locomotive Works, and the G.T.W. He was appointed superintendent motive power and car equipment of the Central Vermont at St. Albans on October 1, 1948. Mr. Selbee is a member of the Locomotive Maintenance Officers' Association, the New England Railroad Club, and the Battle Creek Engineers' Club.

Arthur Selbee

Harry G. Miller, mechanical engineer of the Chicago, Milwaukee, St. Paul & Pacific, has retired. Mr. Miller was born at Creston, Iowa, on January 10, 1887. He received the degree of B.E. in M.E. in 1912 at the University of Iowa, and in that same year became a draftsman in the employ of the Chicago, Burlington & Quincy. He was in miscellaneous occupations from 1915 until 1917 when he entered the U. S. Army, serving as a first lieutenant, 338 F. A. He entered the mechanical department of the C. M. St. P. & P. in 1919. He was appointed engineer of tests on March 1, 1936, and mechanical engineer on June 1, 1942. Mr. Miller served

as a member of the A.A.R. Mechanical Division Committee on Specifications for Materials, and was a member of the American Society of Mechanical Engineers and of the American Society for Testing Materials.

Diesel

M. H. Crandall has been appointed assistant diesel supervisor of the Chicago & North Western, with headquarters at Council Bluffs, Iowa.

Shop and Enginehouse

Francis D. Henry, night general foreman of the Buffalo (N. Y.) shops of the New York Central, has been granted a leave of absence to accept appointment as mechanical engineer for the Japan Logistical Command, Yokohama. The command is engaged in extensive railway rehabilitation.

Master Mechanics and Road Foremen

W. S. Plummer, master mechanic, Pittsburgh and Conemaugh divisions of the Pennsylvania, has been appointed master mechanic, Columbus and Cincinnati divisions.

H. H. Brucks, assistant road foreman of engines, Lake Shore division, of the Chicago & North Western, has been appointed road foreman of engines at Tracy, Minn.

P. Harclerode, foreman at the Grand Rapids, Mich., enginehouse and car shop, has been appointed assistant master mechanic of the Columbus and Cincinnati divisions.

P. G. Jamison, assistant master mechanic of the Columbus and Cincinnati divisions of the Pennsylvania, has been appointed assistant master mechanic of the Fort Wayne division.

M. D. Curran has been appointed assistant road foreman of engines, Lake Shore division, of the Chicago & North Western at Green Bay, Wis.

T. Roy Burdette, Jr., has been appointed road foreman of engines of the Southern at Spencer, N. C.

Car Department

W. A. Melms, general car inspector of the Michigan Central at Detroit, has retired after 39 years of service.

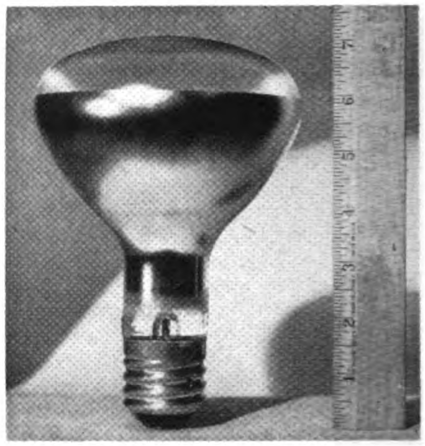
J. E. Knittle has been appointed general car inspector of the Michigan Central at Detroit.

Obituary

Claude R. Pflasterer, retired engineer of tests of the Union Pacific, died January 21 at Omaha.

NEW DEVICES

(*Continued from page 101*)



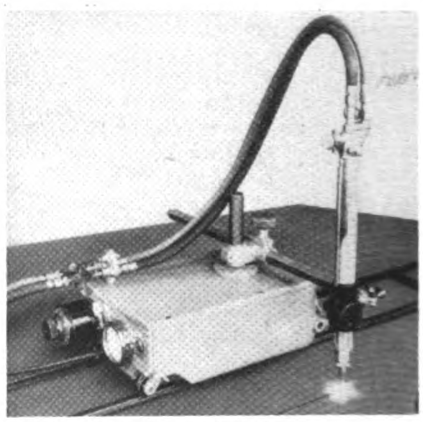
500-Watt Reflector Lamps

Two 500-watt R-40 reflector lamps have been announced by General Electric's Lamp Division, Nela Park, Cleveland, Ohio. The two lamps, one with a flood beam and the other a spot beam, are designed to meet growing demands of outdoor industrial applications.

Made of heat-resistant glass, with faces five in. in diameter, the lamps have mogul screw bases. Preliminary performnce data indicate a mean candlepower in the central 10-deg. cone of approximately 20,000 for the spot, and 4,000 for the flood lamp.

The new lamps are higher wattage companions of the 300-watt R-40 reflector lamps, and it is expected that they will extend the fields of applications of reflector lamps, where the requirements are high light output, sturdy construction and easy maintenance.

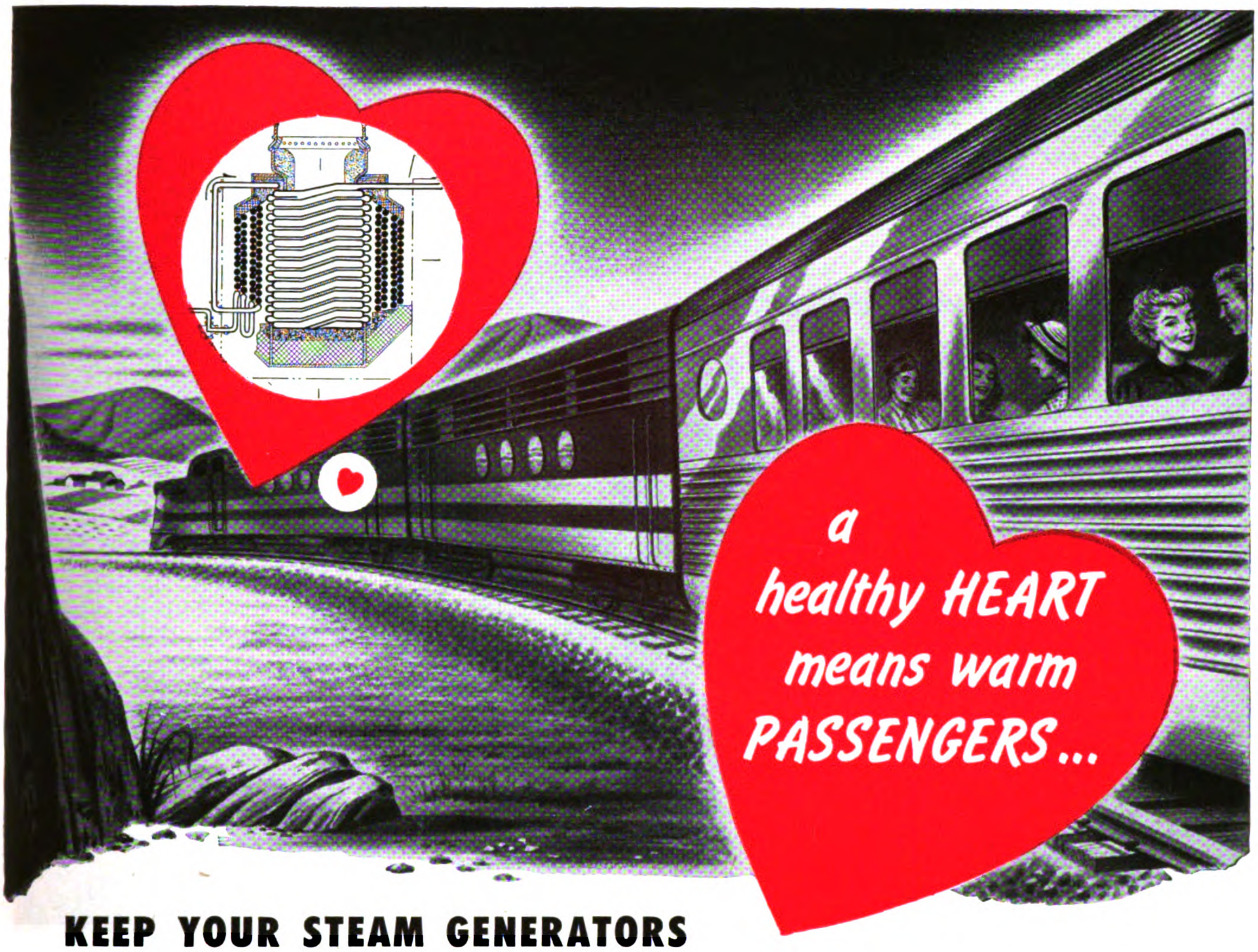
◇



Portable Gas Cutting Machine

Recently announced by the Air Reduction Co., Inc., New York 17, is their newest unit, the Airco No. 20 Radiagraph. It is a portable, motor-driven, straight track-guided machine with the advantages of a

Ideas for Diesel Maintenance



KEEP YOUR STEAM GENERATORS CLEAN WITH PENNSALT PM-90® DESCALING

Today's longer trains are throwing a greater demand than ever on train heating systems. For the maintenance man, this means better care . . . more frequent cleaning . . . of the hard-working steam generators. Naturally, with maintenance costs up, you're looking for fast, efficient cleaning and descaling at lowest possible cost.

The answer, as many roads have found, is descaling with Pennsalt PM-90. This special acid-type liquid cleaner is compounded particularly for effective removal of baked-on lime deposits in *all* the tubes—yet it's inhibited to protect the base metal.

What's more, the Pennsalt PM-90 method for descaling is simple to use. It's ideally suited for routine boiler washouts with your present maintenance crew. Your Pennsalt technical service man will be glad to demonstrate the easy, safe PM-90 way to descale.

Progressive Pennsalt, as a basic producer of the chemicals used in railroad cleaning compounds, offers you a dependable competent source for *all* your maintenance cleaning needs.

Call in your qualified Pennsalt railroad technician, or write us direct: Maintenance Chemicals Dept., Pennsylvania Salt Manufacturing Company, 1000 Widener Building, Philadelphia 7, Pennsylvania.

Railroad Maintenance Cleaners by

PENNSALT CHEMICALS

for Industry · Agriculture · Health · Home

traveling carriage for carrying equipment past the work.

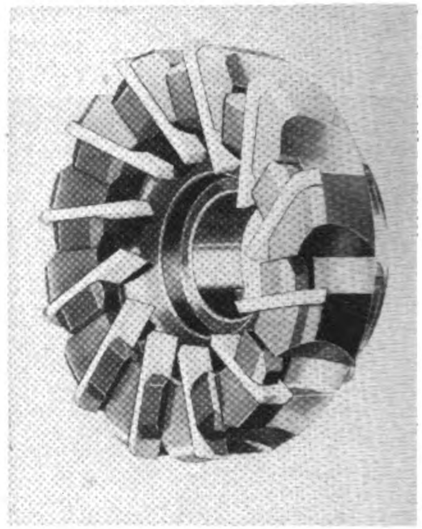
When equipped with proper accessories, it is suitable for circular and irregular shape cutting. All controls are located for easy operation. Any required speed within its range of 2 to 60 in. per min. can be set by finger-tip adjustment. Travel speed can be increased or decreased while cutting is in progress.

The unit weighs only 57 lb. It is 21½ in. in overall length and 10½ in. in width. Its height of carriage is 6 in. and width of track is 8¹⁄₁₆ in. It operates on a 110 volt a.c. or d.c. supply.

Heavy Duty Milling Cutter

Designed for steel production work and heavy cast iron cutting where adequate horsepower is available, and where intermittent or narrow cuts are encountered is a new milling cutter, introduced by Kennametal Inc., Latrobe, Pa.

The style KF Kennamill has four different parts; the body, blades, wedges, and nuts. Its stud-type wedges and screws remain assembled to the cutter body at all times, reducing the possibility of lost parts.



Blades are interchangeable in all slots of any size of cutter body of the same type. Wedges are round and are interchangeable in any slot of any size cutter, either right or left-hand. They can be readily loosened with a soft hammer.

These milling cutters are made in four diameters: 6, 8, 10, and 12 in., either right or left-hand.

◆

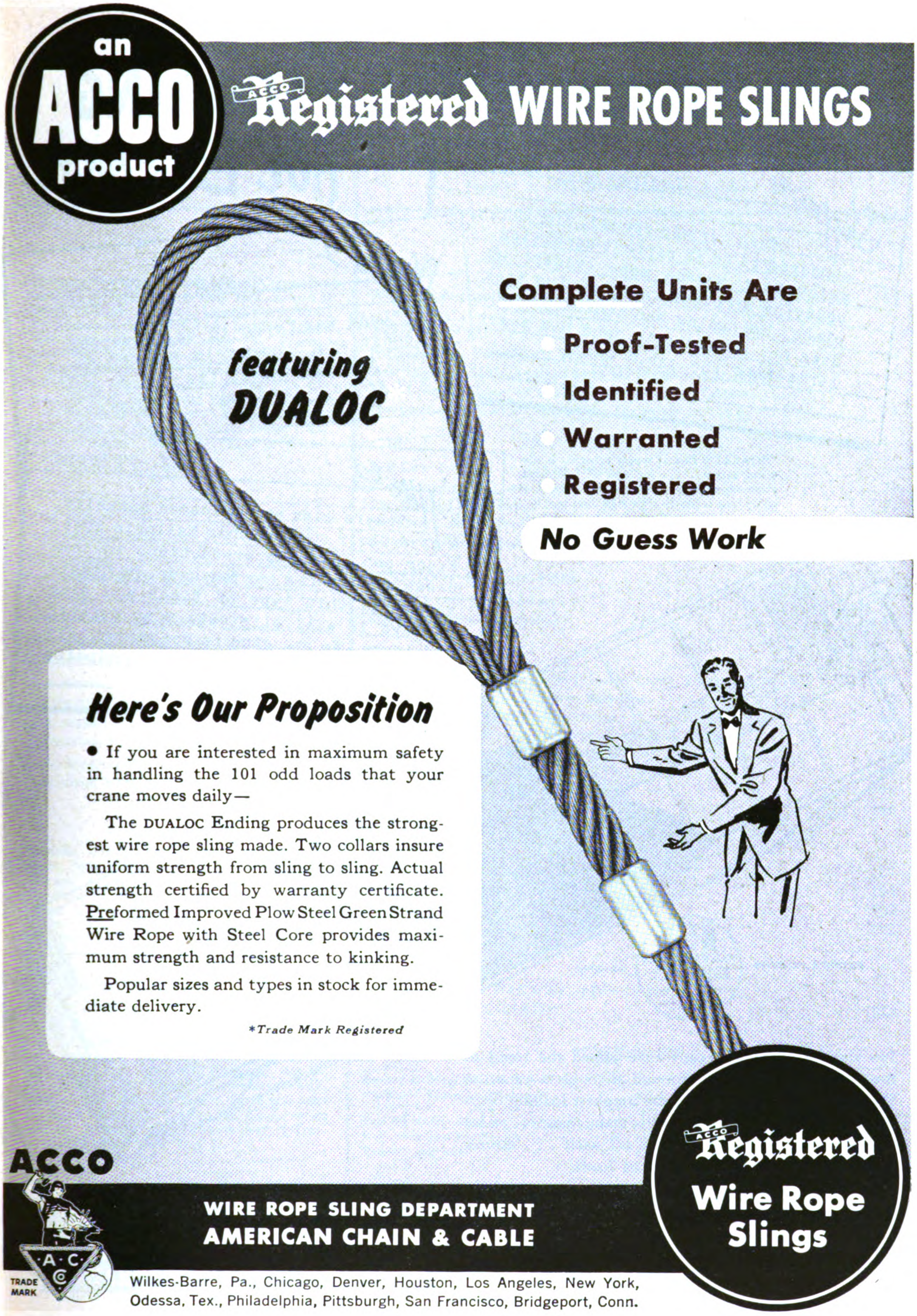
Dual-Purpose Hydraulic Press

A new type C-frame dual-purpose hydraulic press has been designed by the Elmes Engineering Division, American Steel Foundries, Cincinnati 29, Ohio. The unit has a 75 ton capacity and is equipped for double-duty performance.

A long table is provided and can be utilized for straightening lengthy material. This table is removable, making the press usable as a general-purpose straightening press, and in addition an opening in the bed provides for forcing operations.

The dual hand lever is interlocked with the foot treadle, an important safety feature. The ram will not descend until both of the hand levers and the foot treadle is depressed.

In addition to this unit, Elmes manufactures a line of straightening presses from 25 to 500 tons, and forcing presses from 25 to 800 tons capacity.



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ACCO Registered WIRE ROPE SLINGS
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Complete Units Are
Proof-Tested
Identified
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No Guess Work
Here's Our Proposition
• If you are interested in maximum safety in handling the 101 odd loads that your crane moves daily—
The DUALOC Ending produces the strongest wire rope sling made. Two collars insure uniform strength from sling to sling. Actual strength certified by warranty certificate. Preformed Improved Plow Steel Green Strand Wire Rope with Steel Core provides maximum strength and resistance to kinking.
Popular sizes and types in stock for immediate delivery.
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Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.
ACCO Registered Wire Rope Slings

HERE'S WHAT SHIPPERS HAVE TO SAY ABOUT

NAILABLE STEEL FLOORING for Boxcars

Shipper #1 — Lading: AUTO PARTS

"When car was opened, the load appeared to be in perfect condition, which fact became more evident as removing of blocks and bracing took place. Unloading man stated that he does not hesitate to send his power lifts into the car."

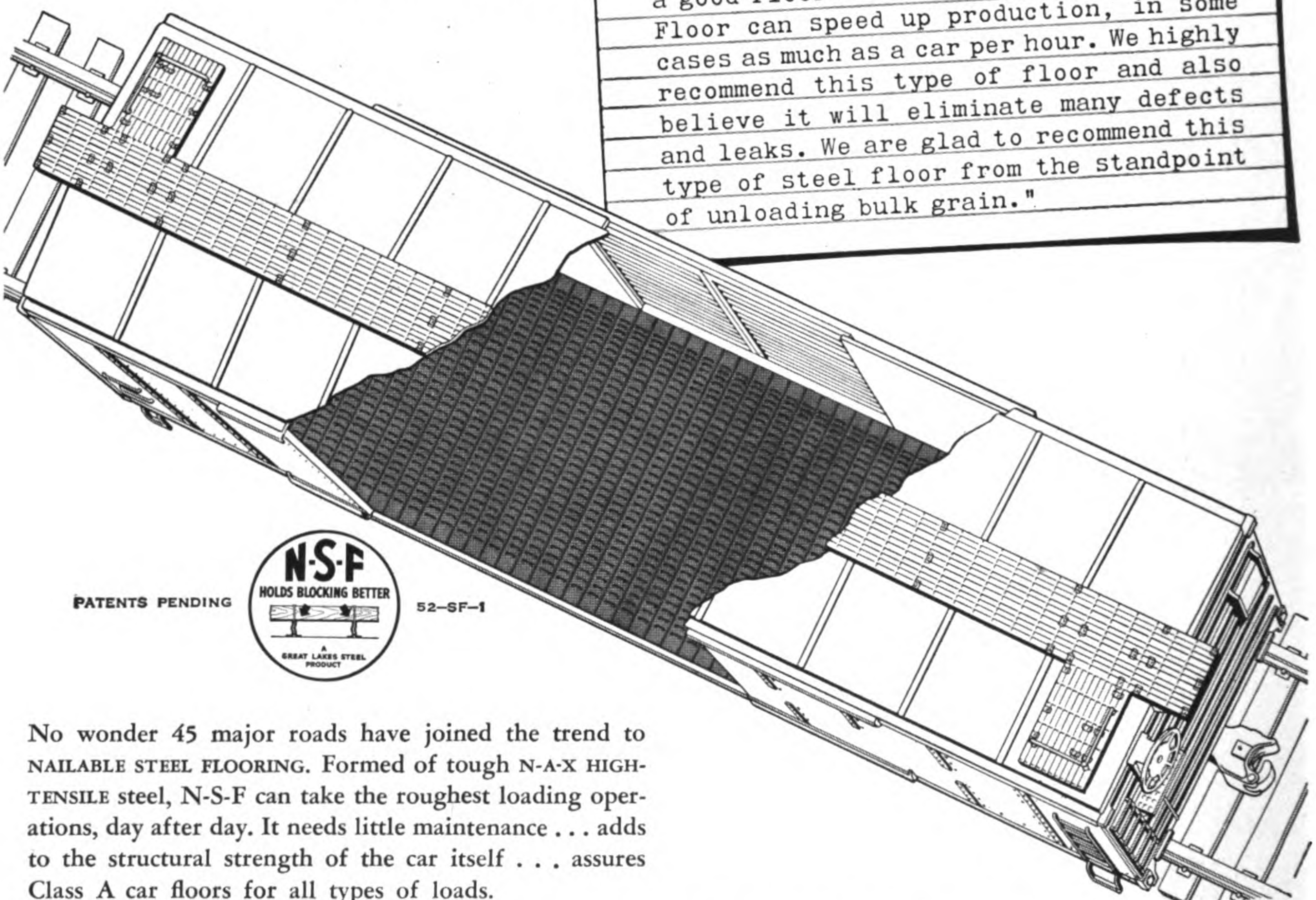
Shipper #2 — Lading: BRASS TUBING

"Load was found to be in perfect condition; bracing in the doorway that was cleated to the steel floor was intact. Load had not shifted."

"BOXCARS: Boxcar supply presently is adequate except . . . for cars of high class commodity fitness, which latter type of equipment is nearly always in tight supply."
—Bulletin No. 80, 1-21-52
AAR Car Service Division

Shipper #3 — Lading: GRAIN

"Where cars are unloaded manually, a good floor such as this Nailable Steel Floor can speed up production, in some cases as much as a car per hour. We highly recommend this type of floor and also believe it will eliminate many defects and leaks. We are glad to recommend this type of steel floor from the standpoint of unloading bulk grain."



PATENTS PENDING — N-S-F HOLDS BLOCKING BETTER — A GREAT LAKES STEEL PRODUCT — 52–SF–1

No wonder 45 major roads have joined the trend to NAILABLE STEEL FLOORING. Formed of tough N-A-X HIGH-TENSILE steel, N-S-F can take the roughest loading operations, day after day. It needs little maintenance . . . adds to the structural strength of the car itself . . . assures Class A car floors for all types of loads.

And yet NAILABLE STEEL FLOORING takes nails easily . . . is not damaged by nailing . . . provides maximum safety for lading and personnel.

Sales representatives in Chicago, Philadelphia, St. Louis, Atlanta, Omaha, Denver and San Francisco.

GREAT LAKES STEEL CORPORATION
Steel Floor Division • Ecorse, Detroit 29, Michigan

PRODUCERS OF N-A-X HIGH-TENSILE STEEL

NATIONAL STEEL CORPORATION

APRIL, 1952

VOLUME 127

No. 4

Railway Mechanical and Electrical Engineer

Founded in 1832 as the American Rail-Road Journal.

Editorial and Executive Offices: 30 Church street, New York 7, and 79 W. Monroe street, Chicago 3. Branch offices: Terminal Tower, Cleveland 13; 1081 National Press bldg., Washington 4, D.C.; Terminal Sales bldg., Portland 5, Ore.; 1127 Wilshire blvd., Los Angeles 17, Cal.; 244 California St., San Francisco, Cal.; 2909 Maple avenue, Dallas 4, Tex.

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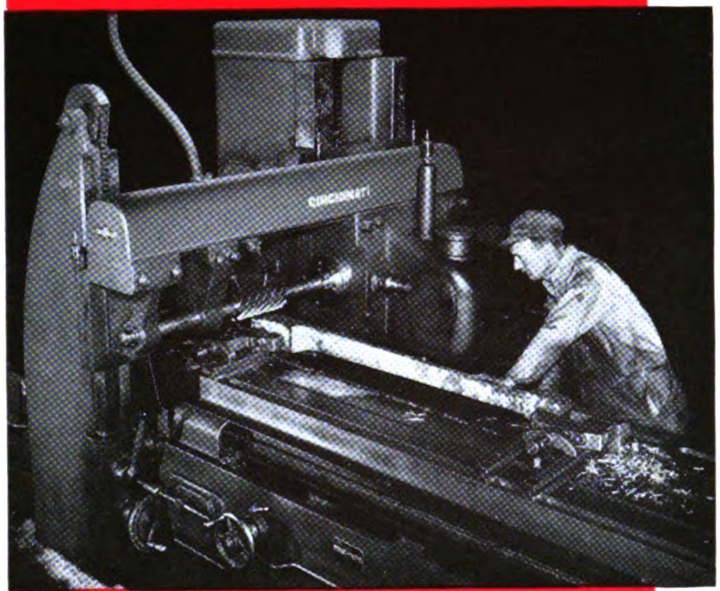
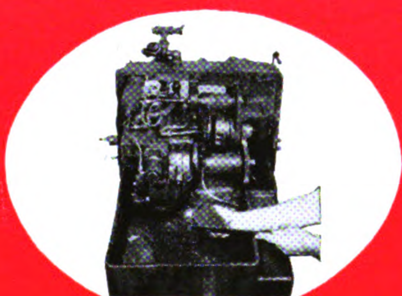
HELPFUL HINTS FOR LONG SERVICE

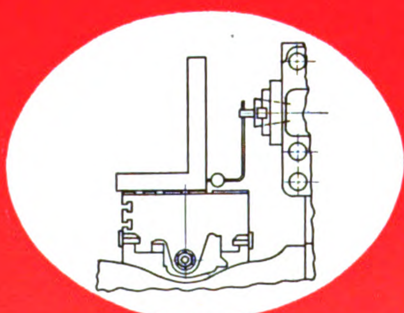
from your Cincinnati HYDROMATIC milling machines



Milling a combination locomotive lever, on a CINCINNATI No. 56-90 Plain Hydromatic having hydraulic manual profile control. If given periodic attention this machine will run for many years without stopping production.



Periodic oil change and attention to filter would have prevented this condition which necessitated a major overhaul.



Suggested method of checking headstock alignment.

While waiting for your new CINCINNATI Hydromatic Milling Machine, production must continue with the old machines. Here are a few precautions which you can take with new or old Hydromatics to keep them running efficiently.

HYDRAULIC SYSTEM

Oil is the very life of a hydraulic machine. Use a good quality hydraulic oil. To avoid a major overhaul job, which usually results when the hydraulic unit is neglected like the one shown in the illustration, clean the filter once a month. It's simple and easy to do. Remove filtering element and scrape out sludge once a year.

LUBRICATION

Lubrication of your CINCINNATI Hydromatic is principally automatic, but even so, it cannot be neglected. Follow the recommendations in the instruction book. As a reminder, make a lubrication chart and attach it to your machine.

LEVELING

Keep the machine level. This is especially important with long bed duplex style machines. To facilitate this operation, leveling jacks are built-in on current model machines; leveling blocks can be obtained for older models.

CLEANLINESS

Keep the machine clean. This is important for three critical areas: 1) table ways on bed, particularly older machines without way covers; 2) spindle carrier ways on headstock; 3) area around the table control plunger.

These easy-to-take ounces of prevention will pay well in years of trouble-free, accurate performance by your CINCINNATI Hydromatic.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

P. S. If you're not acquainted with CINCINNATI Hydromatic Milling Machines, write for catalog No. M-1670 for Plain and Duplex Hydromatics; catalog No. M-1602 for Plain and Duplex Tracer Controlled Hydromatics.

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MILLING MACHINES • CUTTER SHARPENING MACHINES
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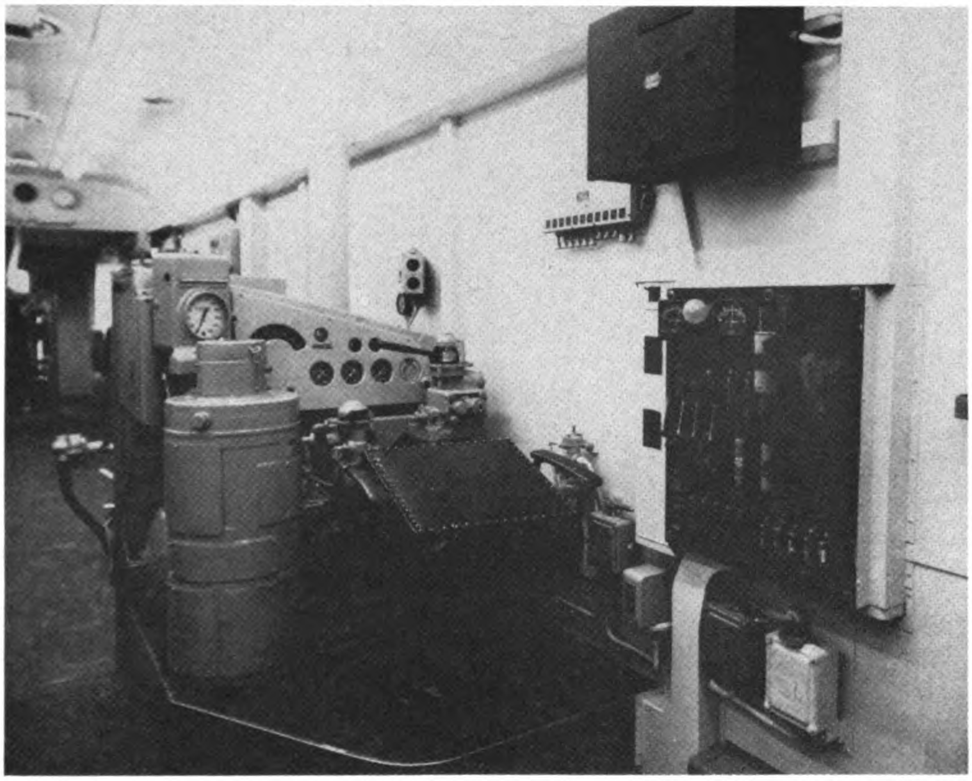
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID



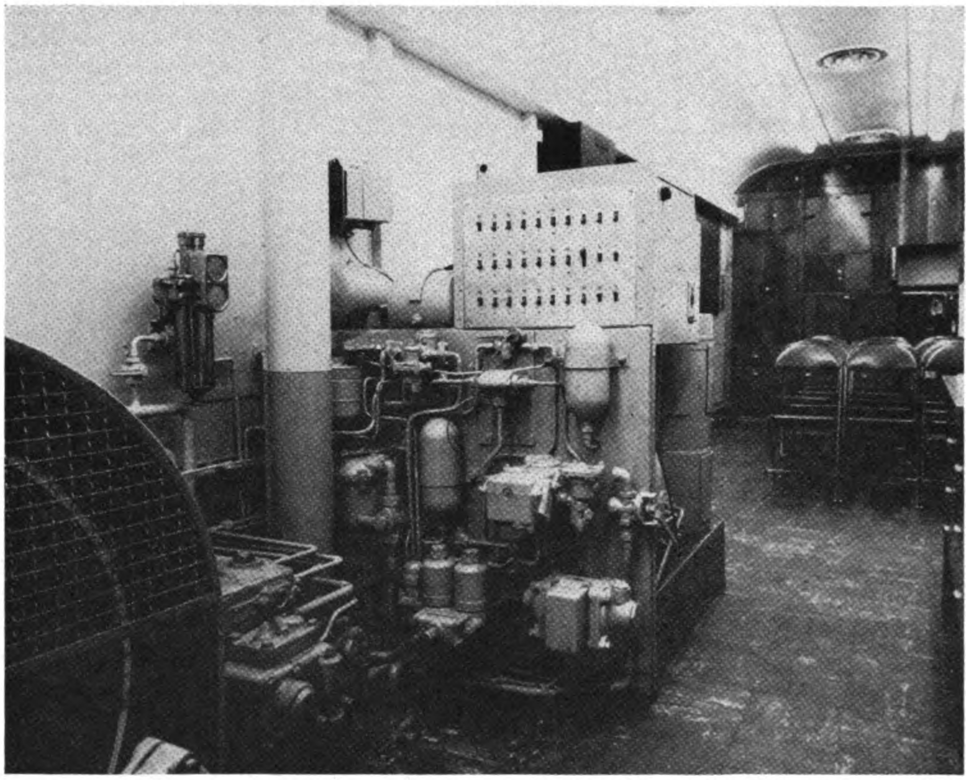
From the control cab all regular diesel locomotive operations can be practiced.

Diesel Instruction Car Built by Illinois Central

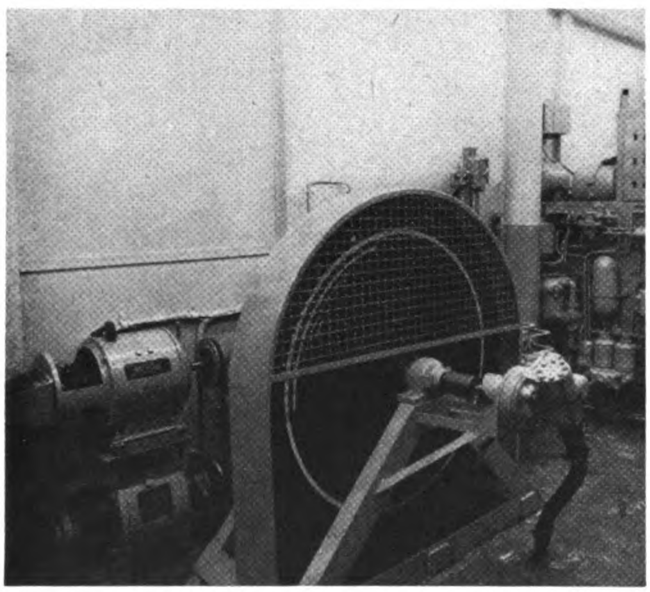
WITH its diesel fleet numbering 30 passenger units and 139 switchers, the Illinois Central decided that the expense of building a diesel instruction car would be a good investment to reduce train delays and to improve generally the efficiency of diesel operation. The work was undertaken at the I. C. Burnside shops in Chicago. In the design of the car, which was converted from a combination baggage-coach, maximum use was made of scrap materials and as many parts as possible were made to perform two, and in some cases, three functions.

The car has a complete set of locomotive cab controls, from which the operation of a diesel locomotive can be simulated. While the engineer is at his controls simulating normal operation of a diesel locomotive, an instructor operating a panel of 30 switches can produce any problem normally encountered in diesel operation. By throwing a switch the instructor can duplicate such conditions as wheel slipping, blown fuses, ground relay operation, lack of fuel or a stopped-up fuel filter.

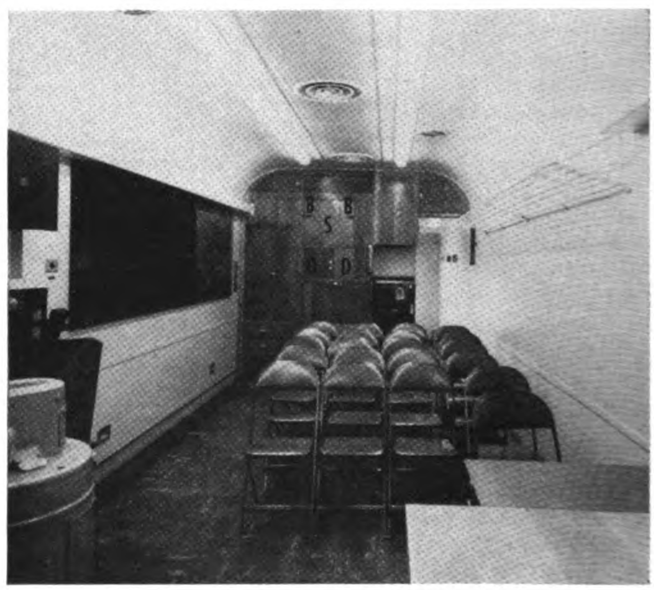
An electric control cabinet similar to that found in a diesel locomotive controls the various circuits activating the training mechanisms. Power to activate these mechanisms has been reduced from 600 to 64 volts. The car is equipped completely for electrical trouble shooting, with all electrical equipment live and working. Some of the larger pieces of electrical equipment had to be scaled



In front of the control cabinet is mounted the trick panel with 30 switches to duplicate problems normally encountered in diesel operation.



A steel disc ½ in. by 36 in. simulates the inertia of the train the student engineman is operating from the control stand. To the left is the scrap tie tamper motor representing the diesel engine mounted on top of the simulated main generator.



The car from the instructor's lecturing area with the cabinet space in the background. When the projector shelf *S* is lowered it is supported through the two support blocks *B* by opening the two locker doors *D*.

down, but wherever this was done the model operation simulates the operation of the actual locomotive equipment.

The accessory end of a diesel engine is mounted along one wall of the car. This installation contains working mechanisms of the overspeed trip, a throttle, models of water and lubricating oil pumps, and a governor. A cutaway section of a diesel engine is mounted along the opposite wall. The sections are painted in various colors to indicate air passages, fuel flow and exhaust. The position of the pistons, rings and gaskets is clearly visible.

A revolving wheel mounted on the floor in front of the engineer's diesel controls has sufficient inertia to represent the movement of the drive wheels, enabling braking and other operating conditions to be observed.

In one end of the car is a steam generator room in which the steam lines, fuel lines and various circuits are painted in different colors to trace a line or circuit. The

other end has a classroom section seating 18 people on folding chairs with padded seats and backs. A blackboard, bulletin board, public address system, and 16-mm. sound motion picture projection equipment complete with rewind and storage space are among the facilities used in training. Ample storage space for literature, file cabinets for instruction manuals and a desk are also in the classroom area. In fact, lockers were installed in every nook where space could be found. A telephone which may be plugged into wayside circuits is also part of the car's equipment.

A private office with a divan that makes into an upper and lower berth is located behind the classroom section and is for the use of the diesel car instructor. The car is air conditioned and equipped with 22 25-watt 4500-deg. white fluorescent fixtures. These furnish a light intensity of 29 foot candles on a 45-deg. plane 33 in. above the floor, or 35 foot candles on a horizontal plane. These were installed so that the class could see into recesses without needing a flashlight. Floors are covered with asbestos tile and the interior is finished in a pastel yellow in the classroom section, grey in the steam generator room, and tan in the stateroom.

Two Primary Ideas in Layout

Two basic ideas were followed in laying out the car. First, as much actual locomotive equipment as possible was used; where the actual equipment was impractical to install, model equipment was used which simulated the operating characteristics of the actual equipment. Second, everything instructional either works like the comparable equipment on a locomotive, or at least sound the same. The car was also designed to be adaptable to changes that might be found desirable from experience, and to changes that might be necessitated by future changes in design of diesel locomotives.

Before undertaking the building of the diesel instruction car, the I. C. made a careful study of all details which they felt should be built into the car, including minor ones. Some of the features decided upon were learned from studying existing cars on other railroads, while others were new ones developed by the railroad.

Cutaway models and other instructional exhibits were placed right next to the wall, keeping them back out of the passage ways as much as possible and leaving open space around them. The office is incorporated in the sleeping room which can be locked. Thus, if the instructor is making out reports or doing other paper work and someone comes in and asks a question which requires leaving his desk to answer, there is never any need to put away the papers he is working on. He merely locks the door to eliminate any risk of his work being misplaced by others who may happen to enter the car. When he is ready to resume work, everything is right in front of him in the proper order as when he left it.

The film magazine is built in; the film locker and the rewind shelf were carefully laid out following principles learned by theI. C.'s Audio-Visual Aids Department in over eight years of experience. The problem of supporting the projector shelf had a particularly interesting solution. The shelf is hinged at the bottom so that it both supports the projector while in use and serves as a door to lock the projector up when it is not in use. When showing pictures the projector had to be easily accessible from both sides and from the front. Therefore cable struts were not feasible.

The solution was both simple and effective. The locker space under the projector shelf was enclosed by two doors, both of which were hinged at the outside edges. A support block was fastened to each of the edges of the projector shelf near the outside corners. When movies or slides are to be shown, these two doors are opened and firmly support the shelf and heavy projector through the support blocks.

To avoid loud blares in some parts of the car and dead spots in others, the public address system has six speakers distributed along the ceiling area. The motion picture amplifier serves also as the PA system amplifier. Microphones can be plugged into any of four strategically located wall receptacles to keep cord lengths to a minimum. Another safety factor is the installation of two aisle lights along one side of the seating area for movement when the car is darkened.

In addition to the desk in the stateroom, there is a combination desk and work bench in the main body of the car with a file cabinet on either side. These three units were laid out with the tops at the same height for spreading out large blueprints. Having the file cabinets next to the work bench is also handy for getting prints and instruction books.

Changes in the Exterior

All but six of the windows in the passenger compartment of the baggage-coach were closed off for several reasons. Without windows distraction to members of the class is reduced to a minimum. A dark room for showing pictures is easily and quickly attained by merely switching the lights off. More wall space is available for charts, and exhibits can be more conveniently installed. The continuous wall also permitted installing the blackboard along one side of the class seating area where it does not interefere with movement between the two ends of the car nor with the installation of large exhibits. At the same time the board can be easily seen by the students by merely turning their heads.

Two new windows were installed for ventilation in the steam generator room, which occupies the space formerly devoted to baggage on the combination car. This room is partitioned off from the remainder of the car by collapsing doors. The outside baggage doors were left as they were for handling large equipment.

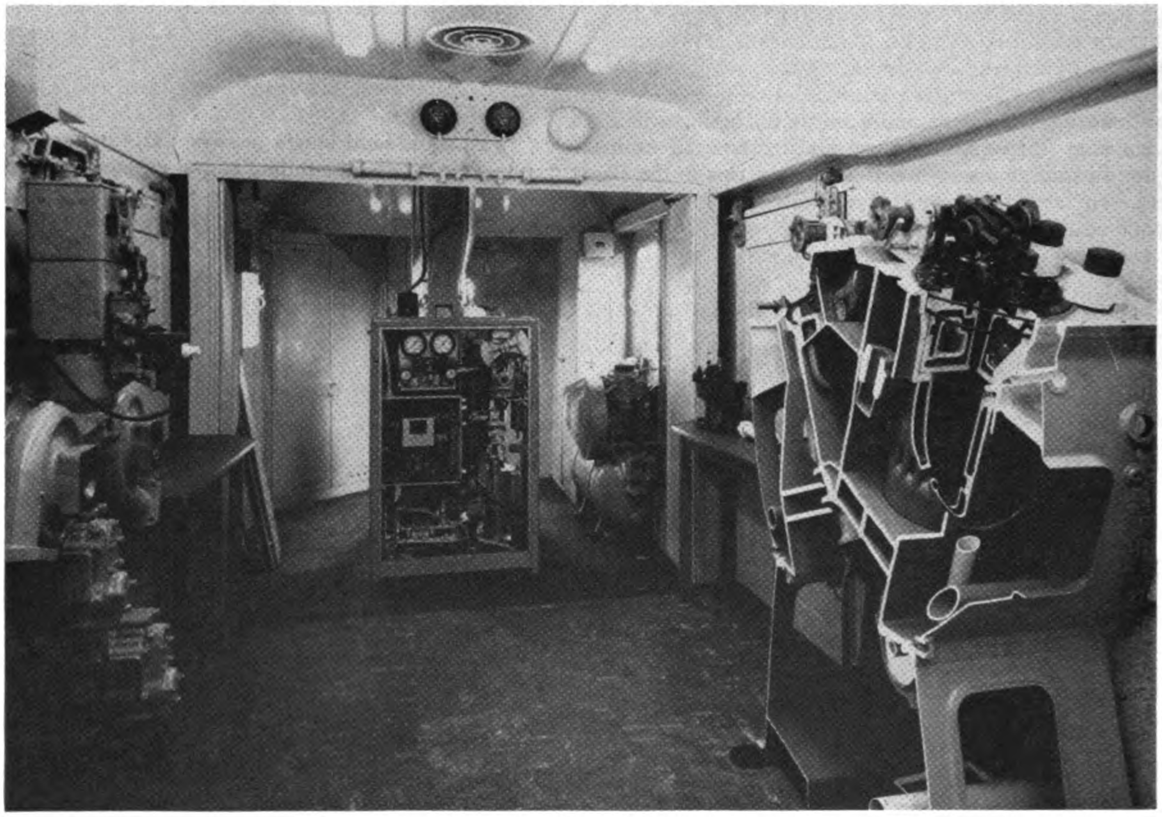
Service Equipment on the Car

The car is equipped to make it completely self-sufficient except for fuel and water. It has a standard General Electric 30-kw. under-car power plant driven by a six-cylinder diesel engine. Receptacles are installed to receive 220-volt three-phase current. The 64-volt d.c. power for controls and for battery charging is furnished by a 10-kw. motor-generator set. Battery power is for emergency lighting and cranking the under-car diesel engine only. As a result, only one 168 ampere-hour battery is installed.

The car also makes its own steam and air. For the former the car has an 1,600-lb.-per-hour Vapor steam generator. Air is furnished by a small air compressor installed essentially for service purposes, but which is controlled by a standard locomotive unloader and doubles for educational purposes in studying the parts and the governor operation.

Although the car is well equipped to furnish its own air, steam and electricity, the plans are to use yard facilities where they are available.

The basic car heating system was unchanged from that on the combination car. It works either on outside steam or generates its own. The evaporator has electric heating units which are sufficient to keep the car com-



The front half of the car, showing the cutaway engine section, the steam generator and the folding doors which close off the boiler room from the remainder of the car

fortable at temperatures down to about 25 deg. The power for these units can come either from outside current or from the under-car power plant.

Manually Controlled Aid Conditioning

Manual air conditioning control was decided upon for greater flexibility and because the diesel instructor aboard at all times has the knowledge to operate it properly. Conditions can be met as they arise. The system is arranged for heating with or without the fan on. Thus the heat can be on without the fan when deadheading, eliminating having to run the under-car power plant.

The steam generator room is not air conditioned and it does not have any floor heating ducts. This is one reason why this room is partitioned off from the rest of the car, the other being to keep smoke and noise out of the classroom section.

Floor heating ducts are installed only in the rear, or vestibule half of the car, but the overhead heating ducts extend the length of the car. The absence of the floor ducts provides flush walls for the mounting of heavy equipment. The lack of floor heat in the front of the car is not expected to be disadvantageous as people in this area are on their feet and moving about, not requiring as warm a temperature as those sitting in the rear.

The water cooler, refrigerator, hot plate and registry desk for all practical purposes occupy a single space. The top of the water cooler serves as the registry desk. Removing this top exposes a 2-kw. hot plate for cooking. Underneath the water cooler is a 1½-cu. ft. refrigerator space, the refrigerator unit of which also cools the drinking water. The refrigerator and the cooking facilities were included in the car because it will be tied up at roundhouses and other locations not readily accessible to restaurants, and for times when the car is moving in freight trains.

The car water system has a 300-gal. overhead tank. The heating water tank has a capacity of 500 gal. and the fuel oil tank a capacity of 250 gal. Standard boiler water and fuel tank gages are installed for both instruction and use. The wash basin, shower and toilet are of the type used in work cars.

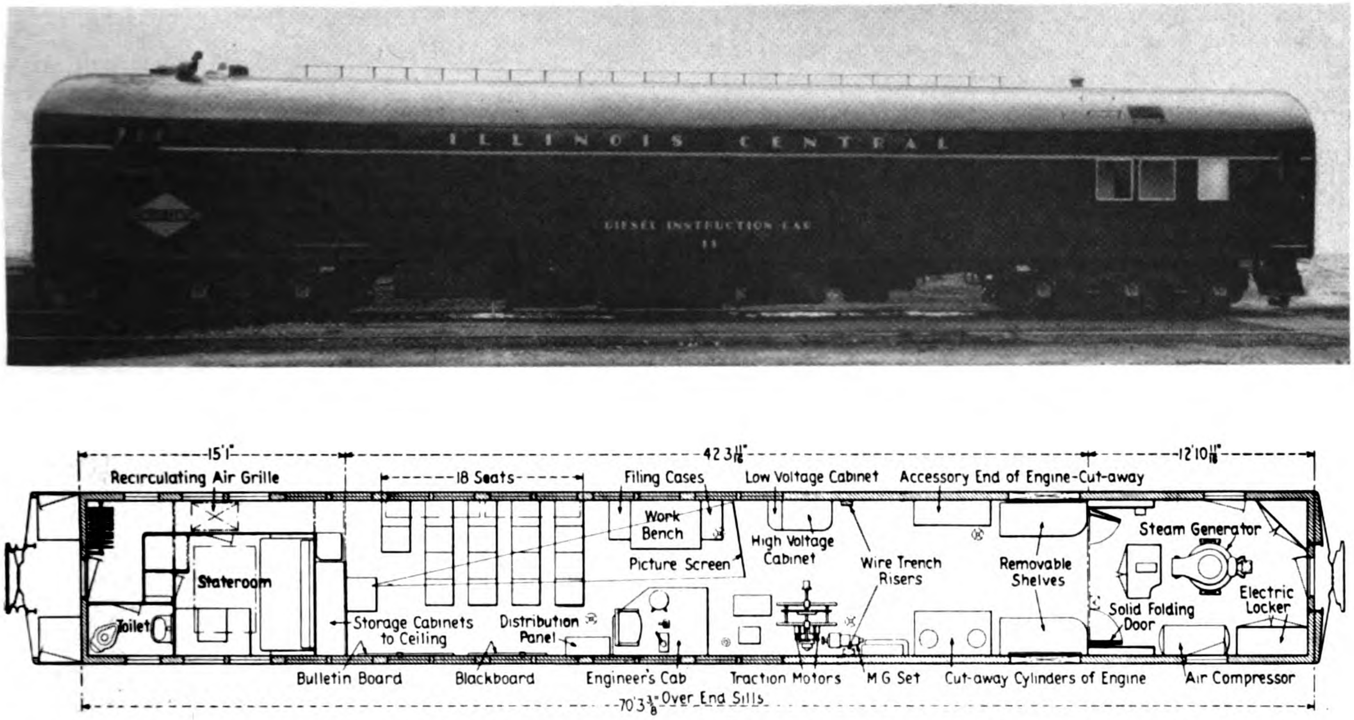
The fuel pump installed primarily for instructional purposes can be used for handling fuel. A tee is put in the pump suction line and one in the discharge line to permit taking, transferring or discharging fuel.

The underneath construction and arrangement of the car follows conventional lines. Protection from freezing is attained by a steam line that taps off the train line to the crossover pipe (with which it is lagged) between the two water tanks thence through the fuel tank to the power plant box, to keep the engine warm for starting, and terminates at a trap. The steam generator has the usual protection against freezing as on locomotives.

The car carries a complete set of locomotive brake equipment for instructional purposes, but which is used also for car braking by setting the equipment up as a dead locomotive.

All Wiring in Troughs

All wiring has been placed in troughs for easy maintenance and for easy adding or changing of circuits in the future. There are two troughs at head level. On one side the trough runs the length of the car; on the other it extends through the rear half only. The two troughs are tied together by a crossover under the floor in the



The diesel instruction car and its floor plan

middle of the car and are joined to the crossover by a riser on each side. The crossover further connects to two lengthwise troughs built into the floor on each side of the center sill and running from truck to truck.

The head level troughs are channels 4 in. deep and 6 in. wide made of 16-gage steel. The tops are hinged for easy access. The hinged tops are not continuous, but any point along the trough can be easily reached. The use of these head-level troughs not only permitted easy access to the wiring, but they eliminated the Z-section closing or sealing strip between the ceiling and the side walls. This construction also gives an opening down through the walls.

The side troughs, or risers, are channels 4 in. by 8 in. and lead to trap doors in the floor which give access to these risers and to the floor troughs. Wires can be fishtailed through either of these sets of risers through these openings. The floor troughs fit the furring space on the underframe and eliminate all under-car conduit.

Tricks to Simulate Actual Operation

Wherever possible, actual locomotive equipment was installed, such as complete engine control, cab control and electrical equipment. Where various practical considerations precluded the installation of the actual locomotive equipment, models were used which simulate as close as possible the true performance of such actual equipment, and which will be used for teaching operation.

For example, in place of installing a regular diesel engine, a scrap tie tamper motor is used. This motor is controlled by the regular throttle equipment arranged to change the speed of this representative engine in the same way that the throttle controls the locomotive diesel engine. A switch was built and attached to the throttle operator which, through field control of the tie tamper motor, changes the speed of the representative diesel engine exactly as the throttle does on a locomotive. This arrangement gives all locomotive engine features, including shutdown, isolation switch, etc.

Attached to the motor is an oil pump which uses fuel oil as a working fluid. This discharges through a 30-lb. feed valve on the pump to simulate main bearing oil pressure on the gage and on the pressure switch as on a locomotive. An orifice is also incorporated in the pump discharge to represent piston cooling oil pressure, which varies with speed as on an actual engine.

This motor representing a diesel engine drives a small generator with the characteristics similar to a locomotive main generator. Two field contactors are included in the circuit as on a main generator, each partially building up the field with both having to be in to attain full field. The output of this generator to the high-voltage cabinet (an actual locomotive cabinet and wiring) is scaled down to 64 volts from 600.

The output of the high-voltage cabinet is fed to two simulated traction motors (1/6-hp. scrap kitchen exhaust fan motors). These are small series-commutator motors with the same characteristic curve as a locomotive traction motor. The two "traction motors" are belt connected to a steel disc 1/2 in. by 36 in. which represents main driving wheels. The disc is made large and heavy to give inertia characteristics comparable to a 7-car lightweight train. This layout also incorporates a 14-in. pulley on the same shaft on which two full-floating clasp brakes operate to bring the disc to a stop. The clasp brakes are operated by a model brake cylinder 1 3/4 in. in diameter. This brake cylinder is connected to the air brake line and is controlled by regular locomotive brake equipment.

This overall arrangement gives acceleration and deceleration characteristics comparable to actual train operation, but on a scaled-down time interval. It requires two minutes to accelerate the mock train to 60 m.p.h., 20 seconds to stop it from this speed with a

service application and 12 seconds by emergency application of the brakes.

Simulated Protective Equipment

The overspeed trip lever can be actuated by the instructor through a concealed solenoid. A microswitch on the overspeed trip linkage shuts down the motor representing the diesel engine, and it cannot be started until the overspeed trip is reset.

Hot engine alarm operation is simulated by an insulated steel box in which is placed a standard engine radiator thermometer, a standard hot engine alarm switch and a light bulb. When the instructor lights the bulb, the temperature within the box rises and the hot engine alarm goes off.

The control panel is equipped to blow fuses by putting shorts in various circuits by trip switches. On 30-amp. fuses for example, a 1.2 ohm resistance is put in parallel with the load, causing some 60 amp. to flow through the fuse with the 72-volt power.

Another feature of the trick switch panel is a group of switches in portions of the control circuit which stop the automatic transition. The transition sequence can be gone through a single step at a time for the first six steps, or until the functions begin to reverse. The principal purpose of this layout is not to trip up the student operator but to show what happens in each step by taking the sequence slowly.

Another trick circuit makes the starting contactors stick. In doing so the contactors are held in the stuck position by a tickler resistance which causes the contactor to be held in the stuck position but not so strongly that it cannot be puled out by hand, thus duplicating the usual condition of a stuck contactor on a locomotive.

Another trick switch trips the ground relay. The wheel slip relay has an adjustable rheostat in the circuit to make it work at any amperage.

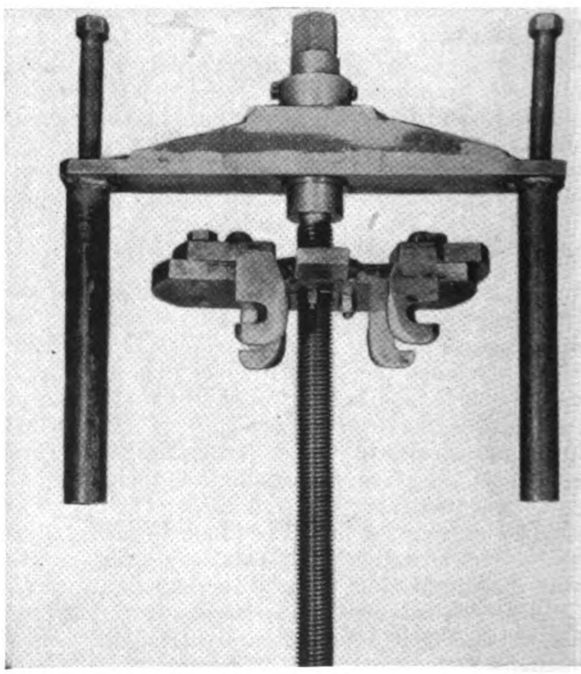
Portable Press Pulls Hyatt Bearings

A portable press is used at the Southern's Chatanooga, Tenn., shops for applying or removing Hyatt locomotive roller bearing outer races. The press requires about one minute for either operation, with a total overall time of about two minutes including all setup work.

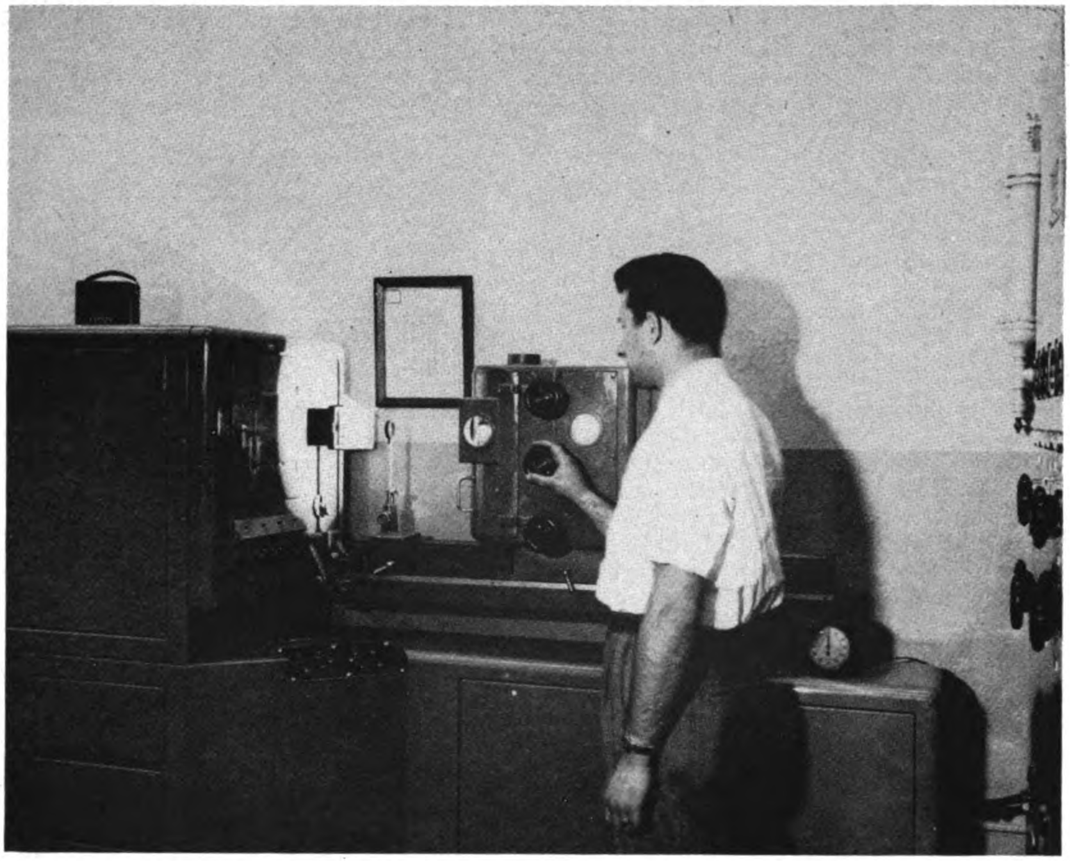
The two main bolts of the jig are inserted into the bearing face bolt holes. Two lugs slide out on a jacking plate until the outside edges are even for removing the race. In this position the lugs engage the inside retainer ring of the bearings at the inside edge of the race. Turning with an air motor pulls the race out. To press the outer race in, the lugs are slid all the way out, at which position the jacking plate overlaps the lug by a half inch and engages the outer race.

The shaft is 1¼ in. in diameter with 7 double-pitch threads per inch. The jacking plate is ⅝ in. thick and has a brass insert ½ in. thick and 3 in. in diameter which is threaded and bolts on the jacking plate. The brass has a collar to fit into the plate and is held by four ⅜-in. bolts.

The jack screw has an overall length of 28 in. with 21 in. of thread. The guide for the holding bolt is made of 1 in. pipe and is 11 in. long. The brass collar in the head was graphited during assembly and requires no further lubrication.



Arrangement for pressing in the outer race



Three-meter spectrograph in operation in the chemical laboratory of the American Locomotive Company at Schenectady

How Spectrographic Analysis Controls Diesel Engine Maintenance

By H. R. Sennstrom,
Research and Testing Engineer,
American Locomotive Company

A NUMBER OF publications in recent years have described the excellent results obtained through spectroscopic analysis of diesel engine lubricating oils in controlling diesel engine maintenance. Outstanding work has been done by Ray McBrian of the Denver & Rio Grande Westen; R. W. Seniff, of the Baltimore and Ohio; L. S. Crane of the Southern, C. C. Mugford of the Southern Pacific, and other railway test department personnel. Avoidance of serious engine failures, longer life of component parts, and more economical locomotive operation have resulted from the work of these investigators in a new application of this scientific tool.

The American Locomotive Company is currently collaborating with 18 railroad companies in extending this new technique in a broad-scale evaluation program. Although only a progress report is possible at the present time, the ultimate results of the program appear most promising. That there is a definite place for the spectrograph in the maintenance of diesel locomotives is a justifiable conclusion on the basis of experience gained thus far.

The Evaluation Problem

The over-all evaluation program was divided into two main phases. First it was necessary to select suitable laboratory equipment, develop standard methods of sampling, handling, and analyzing diesel engine crankcase lubricating oils, and establish base lines to make possible the interpretation of the analytical data in the form

of mechanical recommendations. The second part of the problem involved expanding acquired knowledge into the railroad field on a broad, clinical scale and correlating interpreted indications based on laboratory analysis with the actual mechanical conditions found on examination of engines. The primary phase is now completed and the secondary portion of the problem is approaching completion.

Laboratory Equipment and Technique

The equipment chosen by the American Locomotive Company included a three-meter grating type spectrograph, a multiple arc source, a densitometer, and a variety of other equipment necessary to handle the task economically. This equipment is illustrated and identified in the accompanying photographs.

A review of various methods of taking lubricating oil samples from the crankcase and of analyzing these samples for certain elements resulted in a relatively simple procedure. Experience has dictated that lubricating oil samples should be removed directly from the crankcase while the engine is idling and soon after a road run. It is desirable to sample the crankcase every 15 days.

A measured sample of the lubricating oil is burned and ashed. After an internal standard (lithium carbonate) has been thoroughly mixed with the ash, a small amount of the mixture is placed on an electrode and subjected to arcing in the spectograph. The resulting photographich plate contains the spectrum of that particular ash sample. After developing, the plate is placed in the densitometer for quantitative evaluation. This procedure results in any analytical report giving the desired elements in terms of parts per million.

For control purposes on the Alco 9-in. x 10½-in. Model 244 engine, six chemical elements were chosen. Silicon was selected because it is representative of typical air-borne dirt which might enter the engine through improperly functioning air filters. Iron is an indicator for ring- or gear-wear products. Chromium represents liner wear or water leaks, since water treatment fundamentally involves a chromate. Aluminum is representative of the aluminum piston and lead and copper represent or indicate crankshaft bearing conditions.

Laboratory Engine Tests

An extensive series of full-scale laboratory engine tests were run to determine fundamental base lines which would aid in interpreting the analytical data obtained on the spectrograph. First, a standard engine was run for an extended period under as nearly ideal conditions as possible to establish fundamental wear-rate data. Frequent lubricating oil samples were removed from the crankcase and subjected to spectrographic analysis. In this way normal levels of each of the six elements were established, which represented good engine-component performance.

The engine was then subjected to certain types of maltreatment, including the introduction of dirt into the engine air intake, and the deliberate introduction of treated water into the crankcase.

As a result of these tests, approximate limits were established for each of the elements, representing the transition points between good engine performance and faulty engine performance. To check the laboratory work, a limited number of lubricating oil samples were obtained from engines on various railroads and subjected to similar spectrographic analysis. The results were found to parallel one another.

Having thus established the methods and techniques for sampling the crankcase lubricating oil and analyzing it for the six indicator elements in the spectograph in a simple and economical way, the first phase of the project was considered complete.

Collecting and Interpreting Field Data

It was then necessary to open the second phase of the problem, in which an effort is now being made to establish clinical evidence as to the degree of correct interpretation of spectrographic analyses that is possible under actual railway operating conditions.

Among the 18 railroads collaborating with the American Locomotive Company on this survey there are both large and small railroads running in all parts of the United States, with locomotives operating in freight, passenger, and road-switching assignments. The work was started approximately September 1, 1951, and has been increasing in scope since that date. About 4,000 samples have been obtained from over 800 engines in various types of service. Some samples have been taken on a monthly basis, but most samples have been taken every two weeks, while a few engines have been followed very closely, involving sampling as frequently as every four or five days.

The lubricating oil samples from most of the 18 railroads have been sent direct to Schenectady, although some railroads have had the samples ashed in their own laboratories, forwarding the ash in small vials to the Alco laboratory at Schenectady. A production-line set-up has been installed in this laboratory so that all samples are handled and reported on within 36 hours after their receipt.

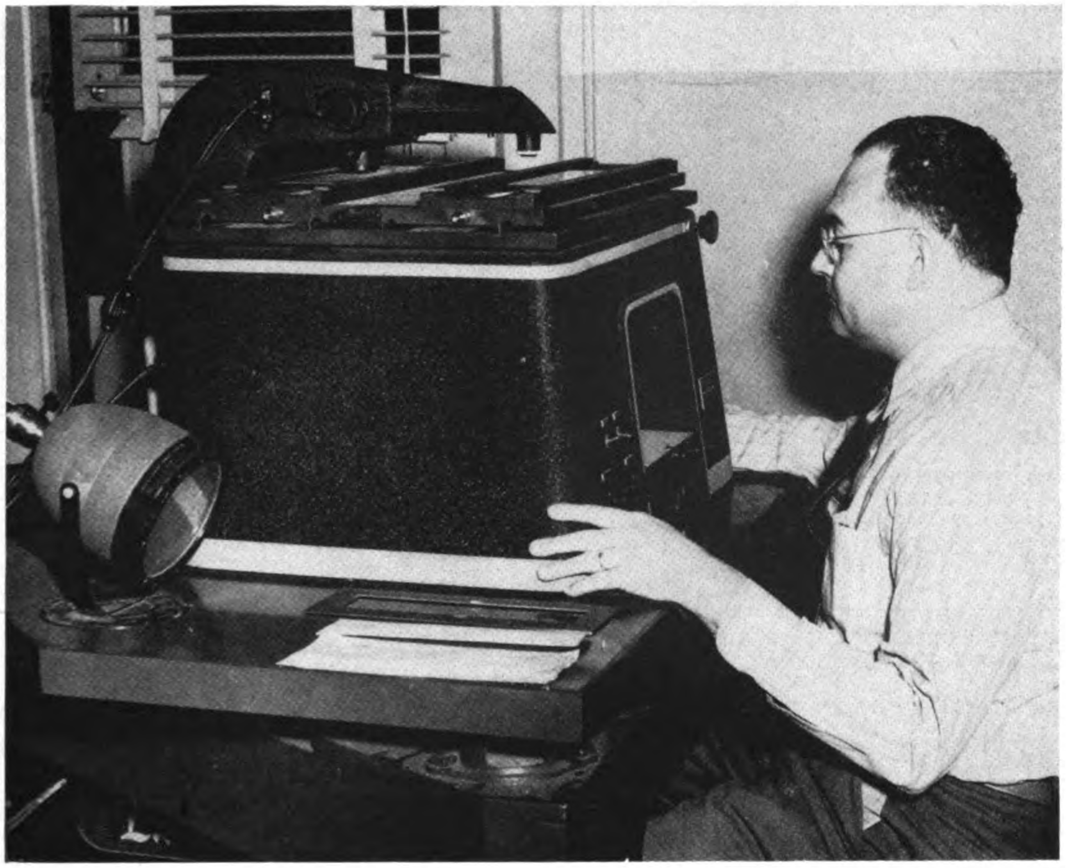
Reports presenting the spectrographic analysis of the six indicator elements in terms of parts per million, together with an interpretation of these values, are issued daily directly to the mechanical personnel and the engineer in charge of tests for the involved railroads. If the interpretation indicates that a specific examination or type of preventive maintenance is desirable, the report so states.

Typical Test Results

Some of the information obtained to date is worthy of note. During the establishment of fundamental base values for the indicator elements, a standard 12-cylinder, 9-in. x 10½-in. Model 244 engine was operated on an 80 per cent full-load cycling schedule in the laboratory. Engine performance was excellent in every way, and there was no maltreatment of the engine during a 200-hour run. Lubricating oil samples were taken at eight-hour intervals. It was noted that wear rates were rather high for the first 24 hours, representing break-in conditions. The wear rates rapidly leveled off to the following approximate values: lead, 5 ppm; silicon, 3 ppm; iron, 8 ppm; chromium, 4 ppm; aluminum, 2 ppm; copper, 3 ppm.

The above values represent the operation of the diesel engine under ideal laboratory conditions. Samples taken from many properly functioning engines in locomotives indicate that the base lines under actual operating conditions are slightly different. The base values found in these cases were as follows: lead, 10ppm; silicon, 6 ppm; iron, 20 ppm; chromium, 5 ppm; aluminum, 3 ppm; copper, 4 ppm.

This difference is undoubtedly due to the more dusty atmosphere in which a locomotive must operate, which results in slightly higher rates of wear. It has been established that so long as wear particles, determined by spectrographic lubricating oil analysis, are in this general range, the engine is functioning properly.



Determination of relative density of spectrum lines using the densitometer.

Effect of Dirt on Engine Performance

The above survey has indicated that dirt introduced through the air stream into a diesel engine can be extremely serious. When dirt was deliberately introduced into an engine during laboratory testing, very alarming results were noted. One-half pound of standardized Arizona road dust of 0 to 80 micron particle size was added to the inlet manifold over a two-hour period. All wear rates immediately rose to high values. It was noted, however, that the silicon, which represents the dirt itself, was quickly filtered out of the lubricating oil. Iron, chromium, and aluminum continued to rise for a considerable time after the dirt had been injected, indicating that ring, piston, and liner damage continued in spite of the elimination of the dirt.

It is surmised that the dirt itself damaged the upper rings. As the upper rings continued to operate in the damaged condition, particles worn from their surface worked downward through the assembly and caused damage to the lower rings and pistons. Some 50 hours after the dirt had been introduced the lead value started to rise, indicating scratching of the lead-in overlay of the bearing due to wear particles. Three hundred hours after the dirt had been applied it was necessary to stop the engine and to replace the piston rings because of the extreme damage done to them.

The above test results have been borne out in actual field service. In some cases improper oiling of air filters has resulted in extreme damage to cylinder parts. In spite of lubricating oil change-out and even flushing of the crankcase, the damage could not be stopped. It appears that if an engine is subjected to any large quantity of air-borne dirt, piston ring replacement cannot be avoided.

Bearing Failure

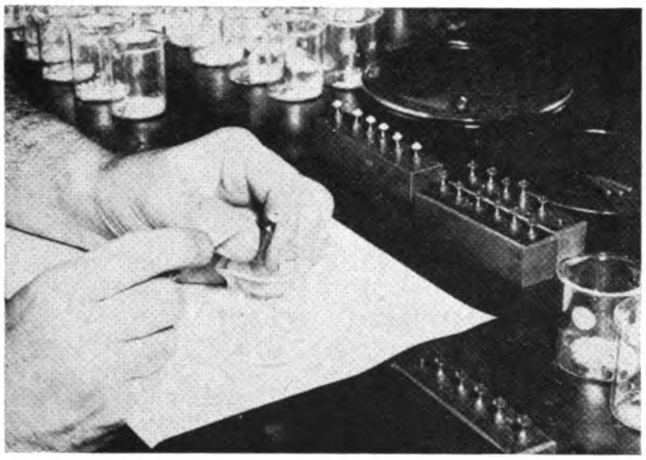
The spectrograph has established itself as a prognosticator of bearing difficulty. Table 1 indicates the detection of incipient bearing failure by spectrograph lubricating oil analysis.

On the basis of the analysis of the November 25th sample, the locomotive was removed from service on December 9 for a bearing inspection, at which time the last noted sample was taken. It was found that one of the main bearings had wiped through the overlay and into the intermediate copper-lead layer. It is important to note that the lubricating oil sample taken 1½ months prior to the removal of the locomotive from service definitely indicated the incipient bearing failure.

Following a bearing failure the lubricating oil is naturally contaminated with particles from the failed bearing. If the lubricating oil is not changed at the time of

Table 1—SPECTROGRAPHIC DETECTION OF INCIPIENT BEARING FAILURE

Date of Sample	9/2	9/13	9/28	10/11	10/18	10/23	11/11	11/25	12/9
Pentane Insoluble, per cent	.01	.01			.05	.01	.01	.01	.17
Ash, per cent		.50	.52	.46	.46	.49	.44	.41	.44
Lead, ppm	6	4	5	6	7	18	30	44	99
Silicon, ppm	4	8	3	5	4	1	1	2	1
Iron, ppm	12	19	16	12	14	17	14	21	19
Chromium, ppm	1	1	1	1	1	1	1	1	1
Aluminum, ppm	1	2	2	1	2	1	2	1	1
Copper, ppm	5	12	9	7	6	6	6	7	13



Lubricating-oil ash being applied to the platform type electrodes prior to insertion into the spectroscope for burning

Table 2—CONTAMINATION OF LUBRICATING OIL FOLLOWING BEARING DIFFICULTY

Date of Sample	9/14	9/19	9/28	10/11	10/24	11/11	11/30	12/9	12/15	12/25
Pentane Insoluble, per cent	.01	.03		.12	.12	.01	.01	.02	.03	.02
Ash, per cent	.44	.40	.37	.38	.33	.40	.54	.47	.46	.52
Lead, ppm	3	2	5	9	26	48	36	17	1	2
Silicon, ppm	5	7	5	28	1	1	3	2	3	2
Iron, ppm	13	14	11	11	18	17	6	4	3	6
Chromium, ppm	1	1	1	1	1	3	2	1	1	2
Aluminum, ppm	1	1	1	1	1	1	2	1	1	2
Copper, ppm	2	3	1	2	2	13	4	3	1	2

bearing inspection, this contamination must be taken into consideration if false indications are to be avoided. Table 2 exemplifies such a case.

In this case the locomotive was removed from service on November 25 and a main bearing was replaced. This bearing, incidentally, had worn through the overlay and down into the copper-lead intermediate layer. Note the gradual reduction in the quantity of lead shown in the samples taken November 30 and December 9. The filters were changed at the time of the bearing replacement and again following the sample of December 9.

Water Leaks and Other Difficulties

Water leaks are identified by a rise in the chromium value. As chromate-treated water enters the crankcase, the water generally is dissipated, but the chromium in the chromate treatment remains in the lubricating oil. In engines equipped with iron liners it can be assumed that all chromium results from water treatment.

However, in the Alco engine utilizing chromium plated liners, the identification of the cause of chromium is slightly more involved. Normally, when a liner is in difficulty the rings also are wearing rapidly. Therefore one can expect a combination of high chromium and high iron to represent ring and liner difficulty, whereas high chromium alone would be indicative of a water leak.

By this method the correlation between the spectrographic analysis and actual water leaks discovered has been extremely good, and even very small leaks can be detected. Experience indicates that chromium values under 50 ppm are incidental water leaks, but values above 50 ppm indicate relatively serious water leakage into the crankcase.

During this period of generalized testing, some unusual results have been obtained. In one instance a seriously misapplied connecting-rod bearing was detected before serious damage occurred. In this case the rod bearing had been placed in backwards, crushing the connecting-rod bearing keeper. The spectrographic analysis indicated severe bearing trouble, which upon inspection proved to be due to the misapplied bearing. In another case a standard-size main bearing had inadvertently been applied to an undersized journal. This caused virtual line contact between the shaft and the bearing, resulting in an extremely rapid increase in the copper and lead values, again denoting an undesirable bearing condition. A broken main bearing cap was similarly detected.

It is understandable that the interpretation and recommendations, particularly at the outset of this undertaking, were not always correct. However, in the past few months excellent correlation has been obtained on such specific instances as high rates of piston and ring wear due to air-borne dirt, excessive water leaks due to misapplied gaskets, cracked cylinder heads, etc., as well as bearing difficulties. In a number of cases serious engine failures have been averted through recognition of poor component-part performance before damage occurred.

Summary and Conclusions

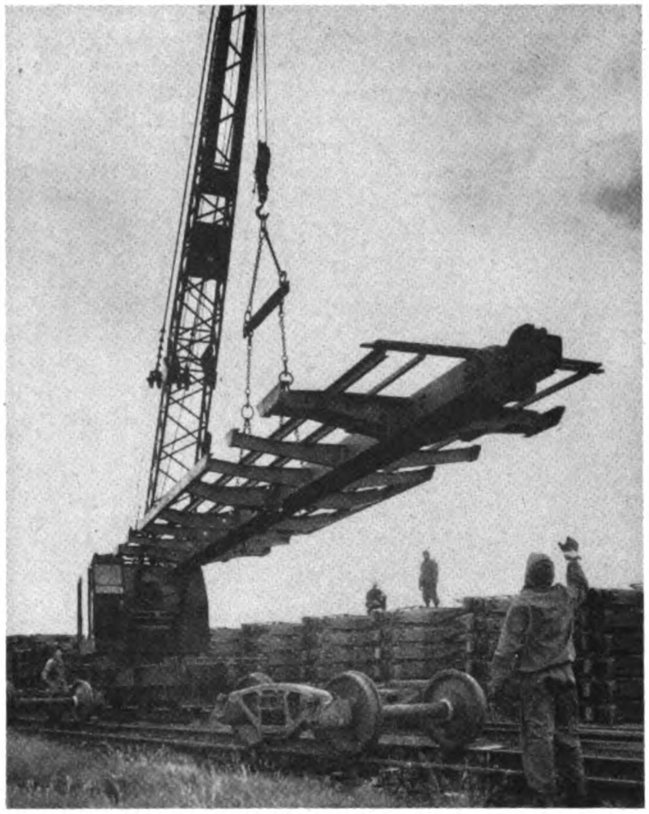
The investigation thus far has proved that the spectrographic analysis of lubricating oil can be used to avert serious engine breakdowns. There is also excellent clinical information to indicate that improvement in diesel engine life can be obtained, particularly with reference to the proper maintenance of air filters so as to avoid undue wear rates due to dirt entering the engine. Lubricating oil quality effect can be noted in so far as relative rates of wear are concerned.

But basically the spectrograph offers a still further potential in its application to railroad locomotive maintenance. At present, diesel engines in railroad locomotives are subjected to periodic maintenance programs which are generally based on mileage or time intervals established rather arbitrarily. Frequently these intervals are rather conservative and engines are overhauled unnecessarily. With the spectrograph's ability to indicate general engine conditions the maintenance intervals might be adjusted to the needs of each individual diesel engine.

It certainly would be desirable to avoid overhauling any diesel engine unless there is ample justification for the overhaul. Within the limits of shop facilities the spectrograph might lead to more rational engine maintenance scheduling which takes into account the characteristics and the condition of each individual diesel engine rather than the characteristics or conditions implied by experience with the poorest performance. Much further study is being made along these lines, and the present investigation has not developed far enough to report with any great degree of conclusiveness in this respect. Indications, however, imply success in this direction also.

A word concerning cost might be appropriate at this time. In general the complete research-type spectrograph available today, together with all necessary components for its operation, involves an investment of from $25,000 to $35,000. The operation of the equipment, together with all supplies and necessary personnel, places the unit cost of each sample analyzed in the range of $5 to $10. It can be readily seen that such expenditure can be amply justified, even if a modest number of engine failures can thereby be avoided.

Assembling steel roofs for new box cars at St. Cloud shops



Underframes, fabricated at Superior, being applied to trucks at St. Cloud.

Box Cars Built at St. Cloud Shops

THE Great Northern has just completed construction of another order for 1,000 box cars at the St. Cloud, Minn., shops, quite similar to those built in 1949 except for a few details of design. The present car has 50 tons nominal capacity and a light weight of 41,800 lb., giving a load limit of 127,200 lb. The inside dimensions are 40 ft. 6 in. long by 9 ft. 2 in. wide by 10 ft. 2 in. high; cubic capacity 3,760 cu. ft.

The cars were built in two assembly lines, underframes being fabricated at the Great Northern shops at Superior, Wis., during last summer. Construction of the cars was begun in October and by early November, St. Cloud shops was on full production of 20 cars a day, a pace which was kept up until January 20 when the last car was completed. Approximately 200 men were employed on the two assembly lines and a small additional force on material fabrication and associated work adjacent to the assembly lines.

In the cars built in 1949, Standard perforated door plates were applied in the doorway only, the rest of the floor being 1¾-in. wood decking from end to end. In the more recent box cars, the Great Northern installed: (a) perforated steel plates from bolster to bolster in 800 of the cars; (b) Great Lakes nailable steel floors in 100 of the cars; and (c) Armco flooring with metal channels and wood inserts in 100 cars.

A feature of the assembly operation was the application of decking to the Standard perforated steel plates in panels before being installed in the cars, thus simplifying and speeding up the work.

Each panel consists of five pieces of 1¾-in. by 5¼-in. selected decking. These five pieces are placed upon and

securely clamped to a jig. Here holes for the decking bolts are drilled and a heavy coat of sealer is applied to the top of the decking. Then the perforated steel plate is applied over the five pieces and secured with bolts. These panels are made up in advance so that when the car program is on an adequate supply is available.

At the two stations on each assembly line where the decking is applied to cars, these panels are placed in the car from bolster to bolster. From the bolster to the end of the car regular 1¾-in. decking only is applied. The decking is bolted and securely wedged from both ends so it is well sealed to prevent leakage. The panels are secured to the car by bolts fastened to the side sills and also by bolts and floor clips to the center sill, also by bolts and clips to the floor stringers. Fourteen panels are used per car from bolster to bolster. The panels are brought into the car manually for installation.

Another different shop practice was the application of Flintcote to the under surfaces of roofs before application to car bodies in the 1949 operation, whereas this material is now sprayed on as the final operation before the cars are ready for service. Assembly is complete, exterior painting done, lining sprayed, etc., before insulating material is sprayed on the undersides of the roofs of the otherwise finished cars.

The Great Northern is particularly proud of its trademark, the mountain goat, carefully stenciled in light-reflecting Scotchlite on the car sides. Also stenciled on both sides of the cars with the same material are the railroad name, car number and a horizontal row of circular targets near the bottom. The latter effectively show the presence of moving cars at grade crossings during the night, or at any other time when visibility is poor.

Straightening Stainless Steel Fluting

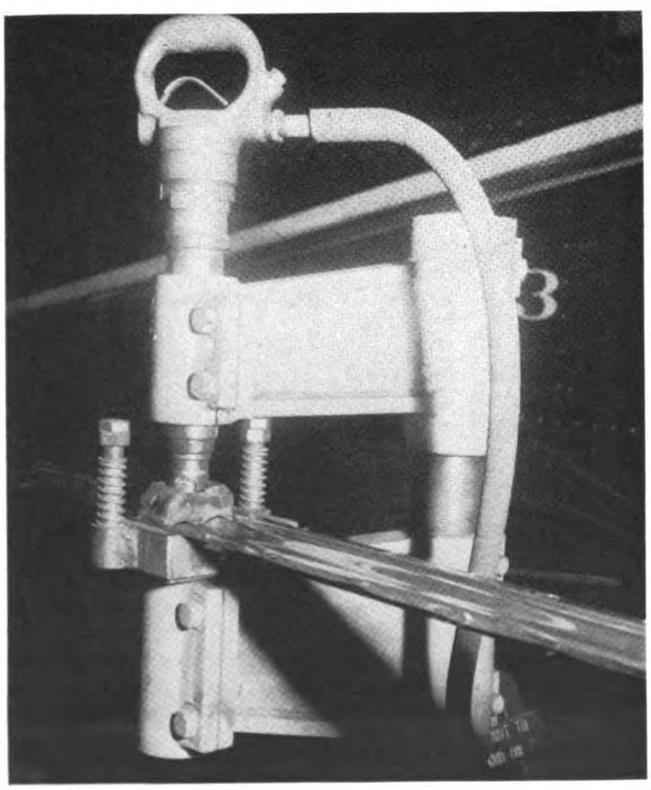
The decorative stainless steel fluting used on passenger cars is reconditioned to look like new with a press and a roller at the Spartanburg, S. C., shops of the Southern. The fluting is cleaned by hand, using alcohol and steel wool. It is run through a press with form dies to knock out the kinks with an air hammer.

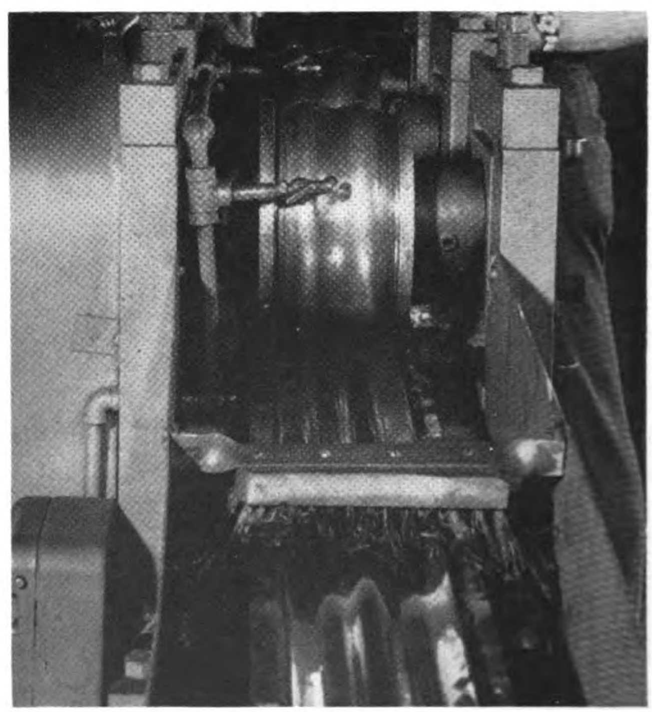
The press, in knocking out the kinks, also spreads the moulding, and the fluting thus requires reshaping. This is done by running it through three pair of form rolls, using No. 20 oil for lubrication.

The rollers are driven at 30 r.p.m. by a 3-hp. motor through reduction gearing, and may be revolved in either direction. The rollers are 8 in. in diameter and mounted on shafts 3 in. in diameter and 1¾ in. long at a center-to-center distance of 18 in. Bearings for the roller shafts are holes cut in 5-in. square plates on the frame of the assembly.

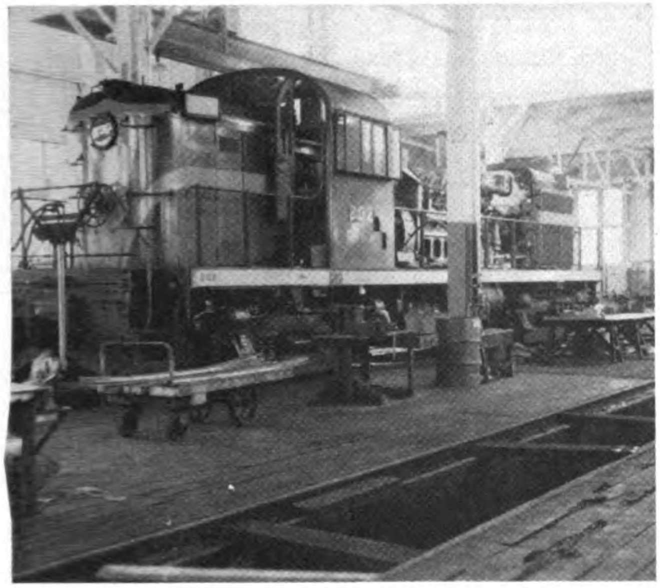
A guide made of ⅛-in. plates is incorporated between the last two pair of rollers to squeeze the molding back to its original dimension. Continuous lubrication is provided by six pet cocks which oil the roller faces. Brushes are used at each end of the operation to wipe the dirt off coming in and to wipe the oil off going out.

The press which knocks out the kinks is foot pedal operated and built up from ¾-in. plate. The main column was constructed from an old axle with the I-beam-section press supports welded in place.

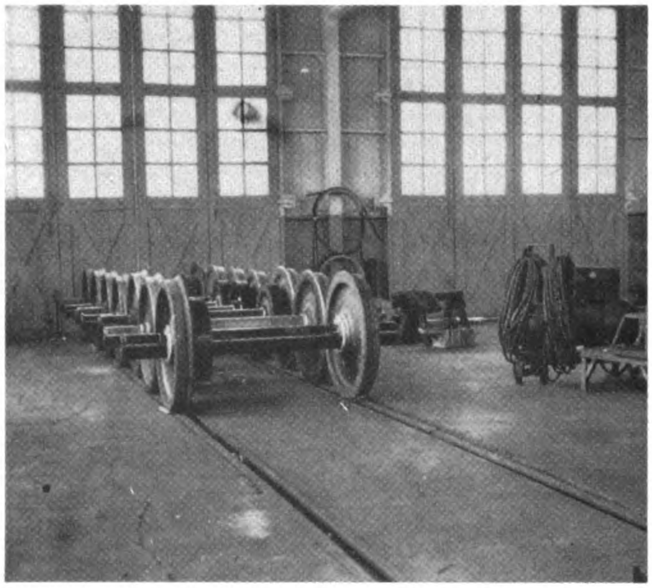




Air-operated, foot-pedal-controlled press (left). As the moulding spreads as the press knocks out the kinks (above), it is reshaped by running it through three pairs of form rolls

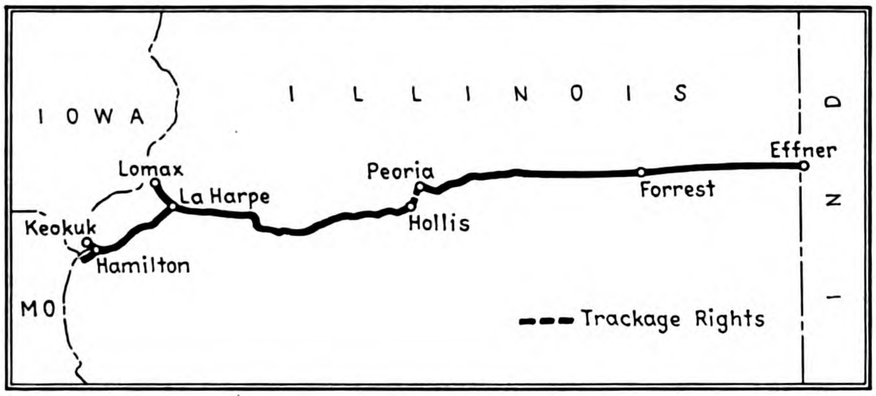


An Alco road switcher undergoing engine reconditioning work



Storage area for wheel sets, welding generators, head fixtures, etc.

Diesel Maintenance on the Toledo, Peoria & Western

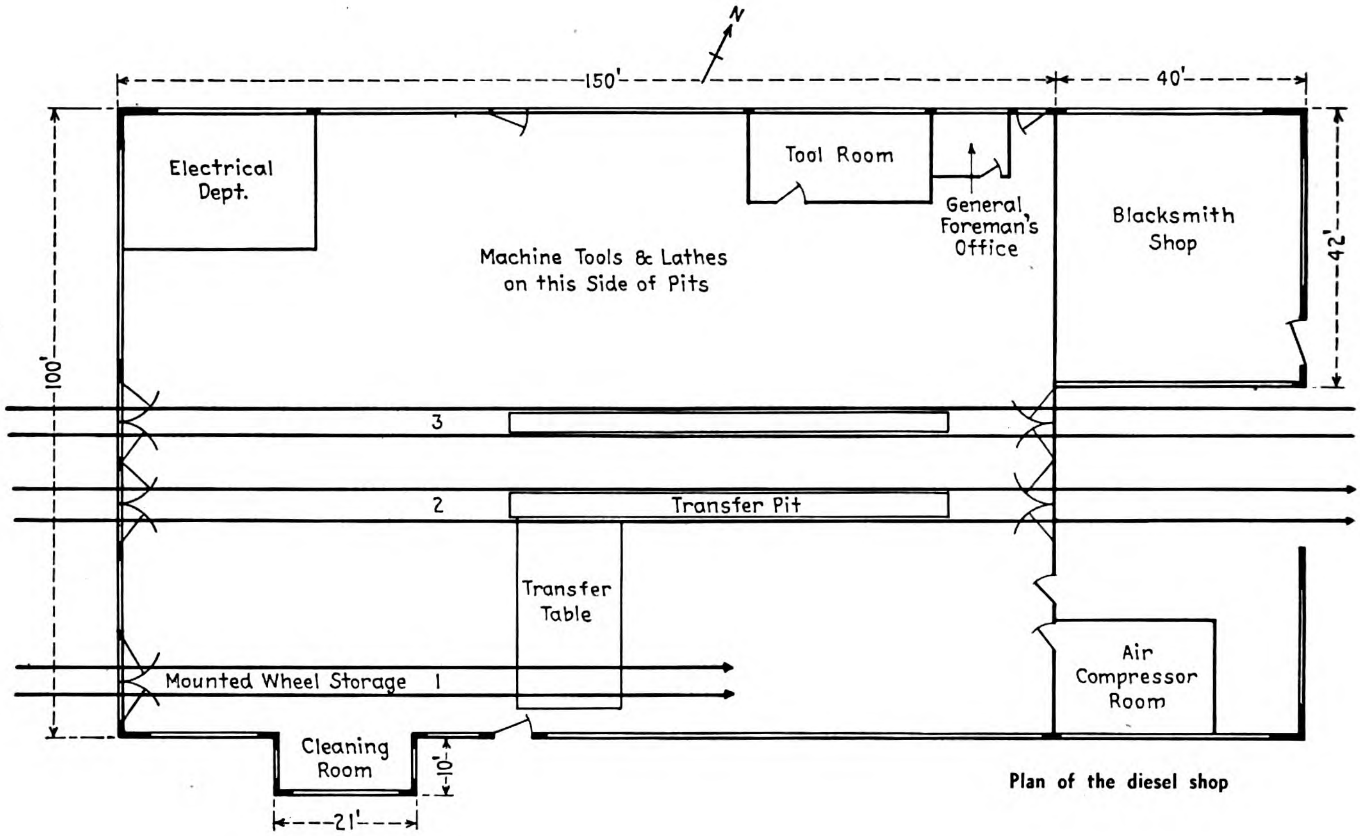


THE problem of coordinating the operation and maintenance of locomotives on a fully dieselized small road is by nature somewhat complex because with relatively few units protection power cannot be furnished on an economic basis. The T.P.&W. has devised a solution to this problem which not only coordinates maintenance, but crew assignments as well, with an overall operation that emphasizes dependability and service to shippers.

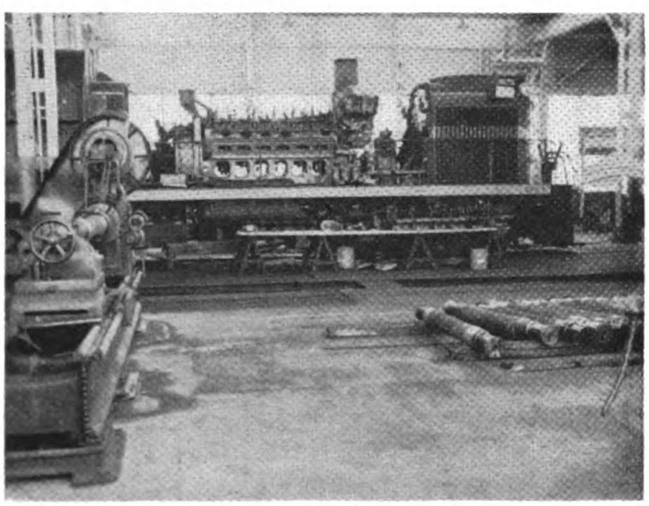
The total motive power inventory at the time this was written comprised 13 units to cover the territory shown on the accompanying map. All maintenance, and all but the most minor servicing, is done at Peoria, Ill. near the mid point of the line. The road normally operates two time freights daily out of Peoria in each direction, a local each day in each direction between Peoria and Effner, Ind., a daily local making a round trip daily between Peoria and Hamilton, Ill. which is just across the river from Koekuk, Iowa on the east side, and a shuttle run between La Harpe and Hamilton. Distances out of Peoria are: 111 miles to Effner; 113 miles to Hamilton; 95 miles to Lomas; and 86 miles to La Harpe.

The 13 motive power units are divided as follows: two General Motors 1,500-hp. road freight units, eight Alco 1,500-hp. road switchers, and three Lima-Hamilton 1,200-hp. switchers. All of the latter are stationed at Peoria.

The two G.M. units leave Peoria at 1:00 p.m. on train 121 to Lomax, returning to La Harpe with the same crew on train 120. This crew ties up at La Harpe for their 8-hr.



Plan of the diesel shop



Most parts repair work is done along each side of the locomotive

rest. A crew coming up from Hamilton on a local run with one of the Alco road switchers takes over the G.M. units, combines the Hamilton cars with train 120 from Lomax, and proceeds to Peoria where arrival is about midnight. After a 2-hr. servicing period, the G.M. units proceed to Effner and return on trains 20 and 21 after getting a new crew at Peoria and another at Effner. Arrival at Peoria of 21 is 11 a.m., completing the daily 412-mile cycle of these two road units.

The second of the two daily time freights is handled by two of the Alco road switchers and leaves Peoria as Train No. 123 at 9:30 p.m. The two units take the train to La Harpe, where one unit is taken off to make the local run to Hamilton and back. At the same time the single unit that was assigned to this La Harpe-Hamilton shuttle service on the previous day is coupled to the other Alco unit that brought Train 123 from Peoria. By making this change and rotating the shuttle unit assignment among the three road switchers, all servicing and maintenance except the daily inspection can be done at Peoria, and this is readily handled by the maintenance man stationed at La Harpe to inspect all units passing through.

The crew that brought the original two Alco's into La Harpe takes over the shuttle unit to Hamilton. The crew from train 121, which arrived about nine hours earlier on

The transfer table is moved by the traveling crane through a fixed sheave just beyond the outer rail of each of the two tracks served by the table. The table moves on six roller-bearing wheels and is secured in place by sliding bars.

the two G.M. units, take over the new Alco two-unit combination. They operate train 123 from La Harpe to Lomax and back to Peoria, where arrival is about 10 a.m. The units depart from Peoria for 4 p.m. arrival with No. 22 at Effner, leaving Effner on No. 23 to return to Peoria at 8 p.m., using a new crew for each of these two one-way trips. This completes the daily cycle of three of the Alco's and covers 469 train-miles, including the 57-mile round trip of the shuttle unit between La Harpe and Hamilton.

Two more Alco's are assigned to night local trains Nos. 24 and 25 between Peoria and Effner. One unit is assigned to each train, but two units are required to handle the assignment as the eastbound and westbound trains pass each other about midway en route. No. 24 leaves Peoria at 8 p.m. and arrives Effner at 6 a.m. No. 25 departs Effner 7 p.m., arrives Peoria 5 a.m.

Formerly both of these trains were covered by one unit which made the round trip daily but necessitated operating one of the trains during the day. The schedule was changed to improve service to the shippers by giving a move in both directions every day. The night schedule permits the cars to be loaded during the day and the loads picked up for movement the same night.

Another pair of the road switchers is used for extras either east or westbound. When used westbound the units do not split at La Harpe as only one crew is available. The remaining road switcher does local work west as Train 103-104.

The General Motors road units and the Alco road switchers exchange assignments on the time freights on occasion, usually when heavy work is required on the G. M. units. This is necessary because of the short time available for maintenance at Peoria. When this interchange takes place, some modification must of course be made to remaining assignments to furnish the two units for the time freight, and this is determined individually for each case. The principal change that must be made regularly is the elimination of the changeout of the shuttle unit at La Harpe.

All servicing and maintenance is done at Peoria in the center of the road. A portion of the existing roundhouse is used for servicing work up to and including monthly inspection. No platforms were installed for this work, nor were any other changes made in the house. The 100-ft. turntable is adequate for turning any type of double-unit locomotive on the T. P. & W.

The shop building is used for quarterly inspection work and heavy repairs as required. The basic structure and layout are generally unchanged from the days when it was used to maintain steam power. Today, the building in addition to being used for diesel locomotive repairs, also serves as a job shop for all other departments of the railroad, maintains miscellaneous equipment for the engineering department, and does heavy metal fabricating work for the bridge and building department.

The shop building is 100 ft. wide by 150 ft. deep and made of corrugated steel. It is served by three tracks—two through tracks near the center of the building and a stub track near the south side which extends a little over half way through the building. Roughly speaking, the eastern two-thirds of the building is devoted to diesel locomotive work, the western third to maintenance-of-way machinery repairs, except for a section along the south edge used for diesel parts cleaning and mounted wheel storage.

One of the principal changes made in the shop in converting it to diesel repairs was the installation of a transfer table and the abandonment of the drop pit. This occurred during the transition period when both steam and diesel locomotives were being maintained. The drop pit was between Tracks 2 and 3; the transfer table was installed between Tracks 1 and 2.

The transfer table was installed for truck changeout because it was easier and cheaper than enlarging the drop pit. It was installed between Tracks 1 and 2, rather than between Tracks 2 and 3 where the drop pit was, so that there would be no interruption to work on Tracks 2 and 3 due to the installation procedure. It further fits in nicely with the use of Track 1 for storage of mounted wheel sets, the wheels being removed from the truck on Track 1 by lifting the truck with the traveling crane.

The transfer table was built by the shop forces. It is built up from heavy I-beam and channel sections and is of all-welded construction. The table moves back and forth between the two tracks on three rails supported on six roller bearing wheels. A fixed sheave is mounted just beyond each of the outer rails of the two tracks served by the table. Movement of the table is made by the traveling crane through these sheaves. A wire cable is hooked to the table, then through the sheave wheel on the side toward which the table is to be moved, and finally to the hook of the traveling crane hoist. Raising the hoist thus moves the table.

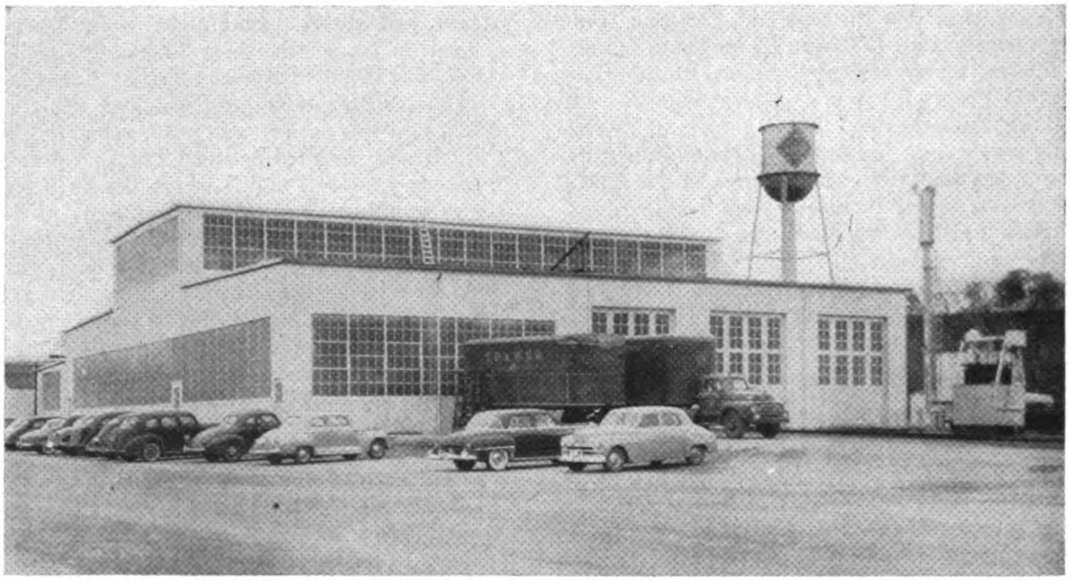
The traveling crane which moves the transfer table spans the center 50 ft. of the shop from the north to the south wall and has a 10-ton hoist. It is supplemented by jib cranes at strategic locations throughout the shop.

Like most other steam shops that have been converted to handle diesel repairs, a substantial amount of heavy machinery has been retained. To buy much of this equipment new could not of course be economically justified in a shop maintaining only a few units, but to retain it at the cost of only its scrap value is worthwhile. In this particular case, more machinery was kept than might normally be expected because the shop does a good deal of work for other departments. Among the machinery retained and the use to which it is put is the following:

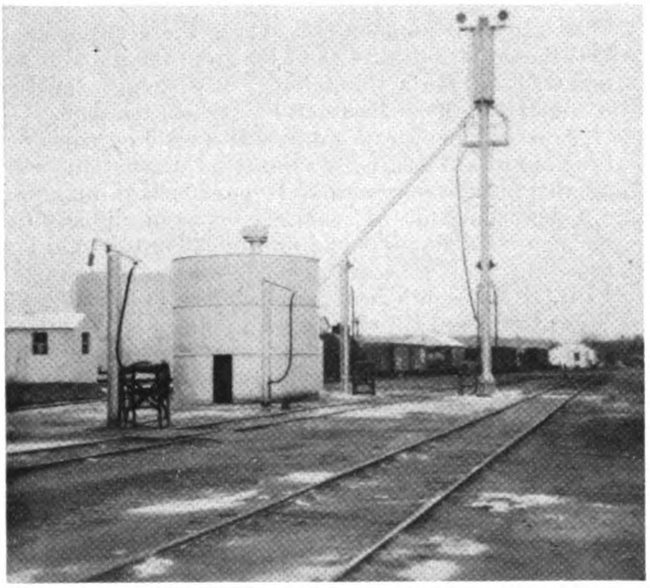
1. 50-ton hydraulic press for straightening and bending plates, pressing out shafts and bushings, and for shop order work for other departments, principally bridge and building.
2. 42-in. boring mill to bore air compressor cylinders and to grind Alco cylinder head joints. The latter is done by affixing a grinder to the boring bars and checking with a dial indicator.
3. Radial drill press for miscellaneous boring, drilling and tapping.
4. 27-in. by 96-in. engine lathe for diesel axle work, refacing heads, and for liner and shop order work.
5. 32-in. shaper for making tools, jigs and fixtures.
6. Two medium sized engine lathes, one 12 in. by 72 in. and the other 14 in. by 72 in. for nuts, bolts, etc.
7. Turret lathe for studs, bushings and roughing out work.
8. An air hammer converted from a steam hammer in the blacksmith shop for miscellaneous work.
9. Punch and shears in the blacksmith shop, 5/8-in. capacity, for cutting plates and bar stock and punching holes.
10. Miscellaneous smaller machinery, such as a 9/16-in. drill press, power pipe vise, power pipe threader, new valve grinding machine, and such new hand tools as socket and open end wrench sets, hand torque wrench, impact wrenches, etc.

General Maintenance Procedures

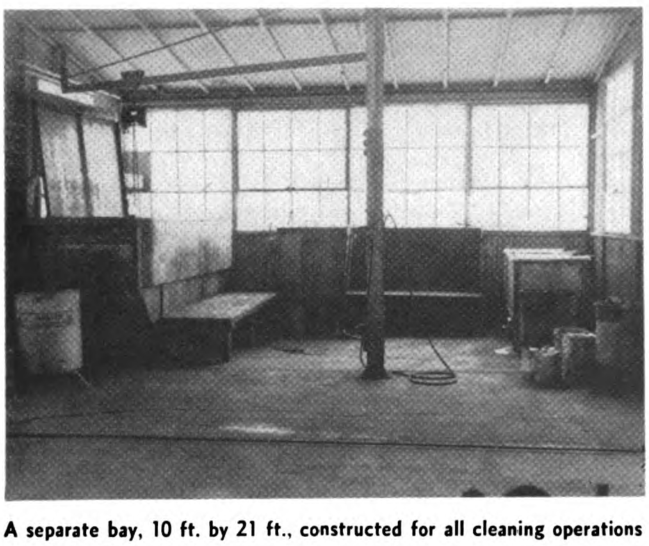
Heavy repairs are made to locomotives after an average



The T. P. & W. diesel shop



Outdoor facilities can fuel and sand two units simultaneously



A separate bay, 10 ft. by 21 ft., constructed for all cleaning operations

of from 300,000 to 350,000 miles of service, which occurs after about three years on the switching locomotives and two years on the road and road switcher units.

Mechanical work done comprises overhauling of cylinder assemblies, main and connecting rod bushings, water pumps, fuel pumps, air compressors and fan drive assemblies, cleaning pistons and grinding valves and seats. Unit exchange is planned for engines requiring more extensive work, and for traction motors, turbo-chargers, governors, tachometer-generators and motor-alternators. Some small motors, such as fuel pump motors, are repaired at Peoria if armatures do not require rewinding. All but the heaviest maintenance is done on main generators, exciters and blower motors. This includes cleaning, dressing the commutator, and spraying with Glyptol. This work is also done to some extent on traction motors.

No oversize parts are used. When liners are worn over .025 in., they are chromed, or re-chromed as the case may be, back to standard. Lima-Hamilton and General Motors liners are currently honed; they are not at present chromed as are the Alco liners. Welding is used chiefly for body work; little reclamation is as yet done by this method.

Five different brands of high-detergent oil are used, with mixing of different brands prohibited. Change is made as a result of chemical test only; this chemical test is made by an outside laboratory twice a month. A daily blotter spot test is made.

Air filters, heads, liners and pistons are cleaned in a small bay constructed along the south wall. The room contains a cleaning solution tank, steam coil drier and an oiler. A jib crane with a 10-ft. radius and hand hoist handles the parts.

Outdoors are two 68,000-gal. fuel oil tanks and a fueling and sanding station that fuels and sands two units simultaneously with two 80-g.p.m. pumps and suitable sand hoses. Sand storage has a capacity of three cars; dry sand storage is 3½ cu. yd. and is mounted on top of a 20-in. tube 40 ft. high. Sand is handled from wet storage to the drier by a conveyor, and is blown from the drier to the dry sand storage. Drying is by a steam coil drier with a capacity of 7 cu. yd. per day.

Changes in Interchange Rules*

By T. J. Boring†

Rule 23

New Section D—Added to provide for welding of high tensile Grade C steel castings such as couplers and yokes, truck side frames and bolsters, etc.

Rule 32

Section (10-L), Flood—A circular letter dated November 19, 1951 by the Secretary, A. A. R. Mech. Div., issued the following interpretation from the Arbitration Committee:

"On account of the unusual severity and extent of flood damage to a large number of freight cars that were partially or totally submerged during floods which occurred in the Midwest last summer, many questions have arisen regarding responsibility, settlements, etc. These questions were placed before the Arbitration Committee at the last meeting and the following interpretations were approved:

" 'Section (10) (1) of Rule 32 and Paragraph (12) of Section (a) of Passenger Car Rule 8 include damage to any part of the car; C. O. T. & S. of air brakes together with the work to be performed as outlined in Section V of Supplement No. 1 of Instruction leaflet Number 2391 when brakes have been submerged; repacking of journal boxes and all other work performed as specified in the Lubrication Manual; rusted or pitted journals; cleaning inside and outside of car and parts thereof of silt, mud, grease, tars, acids, etc.; painting where necessary; renewal of sheathing, lining, flooring or ceiling, due to warped, split or contaminated condition; and including insulation which has been contaminated or otherwise damaged.'

" 'If a car with flood damage concealed in ordinary inspection and without flood damage defect card attached is found to have been partly or totally submerged in flood, the 90-day limit for procuring joint inspection under Section (k) and Interpretation 3 of Rule 4, is considered as beginning upon first receipt of car home after responsibility is acknowledged by damaging line that car was in flood.'

"The Committee feels that the above interpretations will be of assistance to all concerned in handling unsettled cases. On behalf of the Arbitration Committee."

Rule 32

Section (12-a), Contamination—All concerned are again cautioned that cars selected or placed for the loading of contaminating commodities must be confined to cars suitable only for rough freight loading.

Interpretation (9)—Modified to provide delivering line responsibility for replacing and securely tightening tank car dome covers hanging by chain, the same as for bottom outlet valve chamber caps.

* Part 2 of an abstract of a discussion of the changes in Interchange Rules presented at a meeting of the eastern Car Foremen's Association, New York, February 8.

† General foreman, M. C. B. Clearing House, Pennsylvania Railroad, Altoona, Pa.

Rule 34

Eliminated entirely as all freight cars are equipped with United States Safety Appliances or United States Safety Appliances, Standard.

Rule 57

New sentence added to wording on illustration to provide for use of alternate type of air hose nipple which has the word *Top* marked on face of one of the hexagon flat surfaces. Same must be mounted as shown in the illustration.

Rule 60

Note on illustration shown on page 137, covering method of stenciling for air brake cleaning, modified to clarify the intent that stenciling should be on either side or either end of the reservoir presenting clearest view from outside of car.

Sections (g) and (L), Notes—Eliminated and new Note added following this rule listing the air brake instruction pamphlets applicable to cleaning of air brakes. All concerned should familiarize themselves with the requirements of these pamphlets and perform the work strictly in accordance therewith.

Rule 66

Paragraphs (b), (d) and (h)—Modified to show that all work of repacking journal boxes must be performed as required by the A. A. R. Lubrication Manual.

Interpretation 4—Modified to indicate that list and two new Notes thereunder on page 223 (Rule 101) specify what types of spring packing retainers may be substituted for each other in repairs, and not to make new applications of same in separable bolted type journal boxes on freight cars.

Rule 69

Section (g)—Modified account cast-iron wheels advanced from Recommended Practice to A. A. R. Standard by letter ballot.

Rule 70

Sections (f) and (g)—Modified by omitting reference to *1-WT* wrought-steel wheels account changes in Rule 98-(i) involving basis of charges and credits for *1-W* wheels.

Rule 82

First paragraph—Modified by omitting reference to Paragraph (i-2) of Rule 98 changed by eliminating service metal basis for turned *1-W* Wrought-Steel wheels.

Wheel Gages—Figures 4-A, 4-B, 4-C, 4-D, 4-E, 7, 8-A and 9 modified to conform with similar Figures in revised Wheel and Axle Manual.

Rule 85

Last paragraph modified to provide a one-month period

of grace (to 13 months old stenciling) before failure of journal roller bearing units due to overheating becomes handling line responsibility.

Rule 95

Fifth and sixth paragraphs—Modified to show that credit at secondhand value should be allowed for missing *D* coupler body and parts, or *D* coupler and parts removed in good condition when applying another coupler. These changes are due to previous elimination of average credit prices for *D* coupler parts from Rule 101, Items 132 to 132-E.

Rule 98

Section (*c-1*)—Modified by eliminating reference to Paragraph (i-2) of this rule and adding "(except 1-WT wheels)" to make it clear that remount gage or limits will continue to not apply to turned one-wear wrought-steel wheels, as provided in Note following first paragraph of Rule 82.

Section (*c-2*)—Modified to show that single plate cast-iron wheels of the 650 lb. size are excluded from the scrap provisions of this rule because they are not made in the bracketed type.

New Section (*c-8*)—Added to provide for use of experimental "A.A.R.X.-2" and "A.A.R.X.-3" cast-steel wheels and to establish basis for disposition or credit when removed from service.

Section (*i-1*)—Modified to provide that charges and credits for *1-W* wrought-steel wheels shall be on basis of prices new, secondhand and scrap, the same principle as for cast-iron wheels, instead of service metal basis. Turned one-wear wheels shall be classed as secondhand if serviceable, when removed or applied. See comments above under Rule 9 for instructions as to what to show on repair cards.

Rule 101

Material Charges—Price adjustments have been made in line with recent quotations resulting in some minor increases and a few slight decreases.

The following changes have also been made in this Rule:

Items 51, 51-A, 51-B and 51-C—Modified by eliminating the words "Worn out." Some roads have been showing combined dirt collector and cutout cock as worn out, giving only the small scrap credit and making full charge as per items 51 and 51-B. This is a condition that seldom exists and cannot be determined at the car. Charge per items 51 and 51-B can now be made only when body is broken or bent and care should be exercised to show proper reason for removal, i.e. broken, bent or leaking.

Items 119, 120, 122 and 123, Notes—Modified by eliminating reference to knuckle locks as there is no difference between the price of high tensile steel and Grade B knuckle locks at the present time. However, billing repair cards should continue to show whether knuckles and locks removed and applied are *H T* or *G B* as per Rule 9.

Item 169-I, Fourth Note—Modified to provide that where car is not fully equipped with approved packing retainer devices, charge of 10 cents will be added to charge for repacking journal boxes to cover R&R or R of each such device. Billing repair card must show whether or not car is equipped with approved packing retainer devices and, if equipped, number of such devices R&R. Showing whether car is so stenciled is not required.

Item 194-D, Note—Eliminated account changes in Rule 98-i involving method of charges and credits for turned *1-W* wrought-steel wheels.

Items 214, 215, 216, 217 and 218—Modified to include additional types of No. 18 brake beams awarded certificates of approval.

New Section 1-A, following Item 250-L—Added to provide charges for short friction draft gears approved for cars of special construction, built new or rebuilt on and after January 1, 1950.

New Items 251-H and 253-J—Added to provide charges for short Cardwell V-18 and Miner A-100-D friction draft gears when classed as non-approved for 24⅝-in. pocket spacing, along with Miner A-69-XB and Cardwell L-11-S.

Brake Beams, Figure 2—Modified to include additional types of No. 18 brake beams awarded certificates of approval.

A. A. R. Approved Types of Geared Hand Brakes (*Page 221*)—Klasing Number D-1051 and Superior Number 726-B have been added to the "Vertical Wheel Type."

Superior Number 565-E has been added to the "Horizontal Wheel Type."

A. A. R. Approved Types of Journal Box Lids (*Page 222*)—Continental Transport Appliances, Ltd. lid No. 114 has been added to the 5 by 9 and 5½ by 10 sizes; Davis Brake Beam Company's No. 113 has been added to the 6 by 11 size; National Malleable and Steel Casting Co.'s "Flexo 4" No. 609 and Symington-Gould Corporation's No. B-270 have been added in the 6½ by 12 size.

List of Approved Packing Retainer Devices (*Page 223*)—This table is modified to show latest drawing numbers and a new Note added to designate which type of approved spring packing retainers may be substituted for each other in repairs per Interpretation No. 4 under Rule 66. The other new Note added prohibits new applications of same in separable bolted type journal boxes on freight cars, but if removed for any cause from foreign cars must be reapplied if in serviceable condition.

General

This Rule has grown from 13 items in year 1885 to nearly 300 items plus tables of weights, sizes, etc., with combinations. The prices were rather frozen during Word War II, considerably increased since, mostly due to the large increase in labor costs. Similar occurred after World War I. Table I shows the changes in the principal items at five stages since year 1895.

Rule 107

Labor Charges, Item 28, Note—Modified to indicate that the use of not less than a 36 in. (instead of **48 in.** minimum length) wrench must be used in tightening tank

TABLE I

Year	Forgings	M. I.	C. S.	H. Sprgs.	Chain	Lumber	⅝ inch or over Rivets	Freight Labor
1895	0.03	0.03	0.05	0.035	0.05	0.025	0.10	0.20
1941	0.065	0.075	0.10	0.055	0.08	0.06	0.22	1.40
1948	0.10	0.15	0.15	0.085	0.13	0.13	0.34	2.25
1951	0.10	0.20	0.17	0.095	0.16	0.155	0.42	2.80
1952	0.105	0.215	0.185	0.10	0.18	0.165	0.47	3.15

TABLE II

Labor, Per Hour	1-38	12-41	2-44	6-46	9-47	9-49	8-51*
Freight	1.25	1.40	1.60	1.95	2.25	2.80	3.15
Passenger	1.40	1.55	1.75	2.15	2.50	3.10	3.45
Tank	1.45	1.60	1.85	2.25	2.60	3.20	3.60
Lubricating and Cleaning	1.00	1.10	1.25	1.55	1.80	2.25	2.55

* During year 1951 there were three increases due to awards granted the employes, which made the A. A. R. freight car repair rates per hour—$3.00 effective March 1, 1951; $3.10 effective May 1, 1951; and $3.15 effective August 1, 1951 based on awards of 12½ cents, 6 cents and 1 cent respectively. Effective February 1, 1952 this rate goes to $3.20 due to the 4 cent award to employes. This latter was issued January 7 by the A. A. R. Secretary by circular letter and increased by total of 35 labor items in the Freight and Passenger Rules.

car outlet valve cap. Does not prohibit use of 48 in. wrench, nor wrench of any length 36 in. or longer.

Item 29, New Note—Added to provide same charge for reapplying and tightening tank car dome cover hanging by chain, as for bottom outlet cap, on authority of defect card. Care should be exercised at interchange points to see that defect cards are obtained for dome covers hanging by chain. See revised Interpretation No. 9 of Rule 32.

Table II shows the increases since year 1938.

Rule 108

Item 2—Eliminated account all brake shoe keys now in freight service are either A. A. R. Standard or A. A. R. Alternate Standard. This iem made other type non-chargeable.

Rule 111

Item 15-b-8, Vent Protector—Eliminated account original application of vent protectors has no doubt been completed and allowance for defective or missing vent protector is included in charge for cleaning AB brakes.

When vent protector is renewed account defective or missing and not in connection with cleaning AB brakes, charge per Item 53 of Rule 101 and Item 25 of Rule 111 is in order.

Item 28, second Note—Modified to clarify the intent that charge is permissible for labor and material for riveting or welding, bolts and lock nuts, securing any type AB cylinder, reservoir, pipe bracket portion, or other air brake devices to their brackets or securing their brackets to car body, whether or not cleaning type AB brakes is involved.

Passenger Car Rules

Rule 2

The effective dates of the following Sections have been extended to January 1, 1953:

Section (e)—Cardboards or suitable receptacles for Defect Cards and Joint Evidence cards.

Section (f)—Brake shoe spark shields.

New Section (j)—Added to provide that passenger equipment cars equipped with Pitt type couplers will not be accepted from owners on or after January 1, 1955.

Rule 7

New Section (e)—Added to provide that the same requirements now specified in Freight Rule 69, regarding the machining and mounting of wheels and axles, per Section *XX* of the A. A. R. Wheel and Axle Manual also applies to passenger equipment cars for interchange service.

Section (f-4)—Second paragraph modified to indicate that standard steel wheel gage specified is Figure 4-E of Freight Code as well as Figure 128 in Wheel and Axle Manual, for use in determining whether height of flange (tread worn hollow) on wrought-steel wheels is 1½ inches or more.

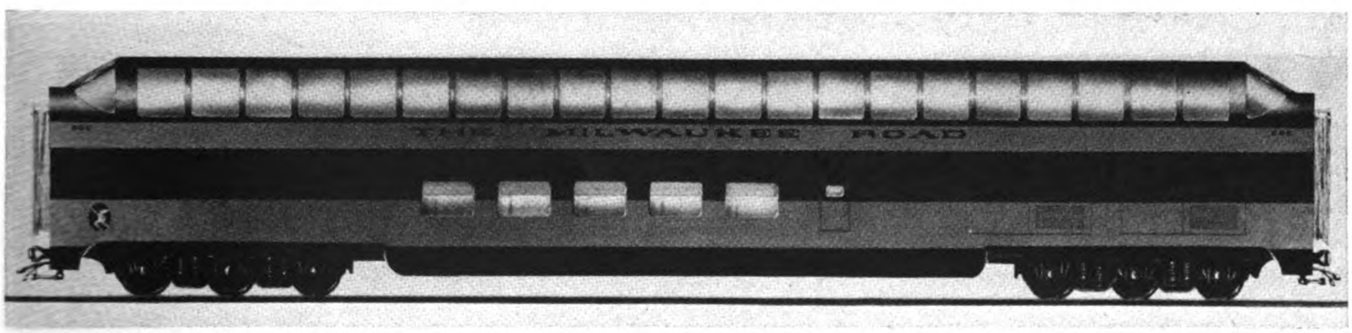
Section (j-2)—Modified and list of air brake instruction pamphlets applicable to air brake cleaning added to clarify the intent. All concerned should familiarize themselves with the requirements of these instruction pamphlets and see that the work is performed strictly in accordance therewith.

Rule 13

Section (b), Item 2—Eliminated account all brake shoe keys now in passenger service are either A. A. R. Standard or A. A. R. Alternate Standard. This item had made other types non-chargeable.

Rule 22

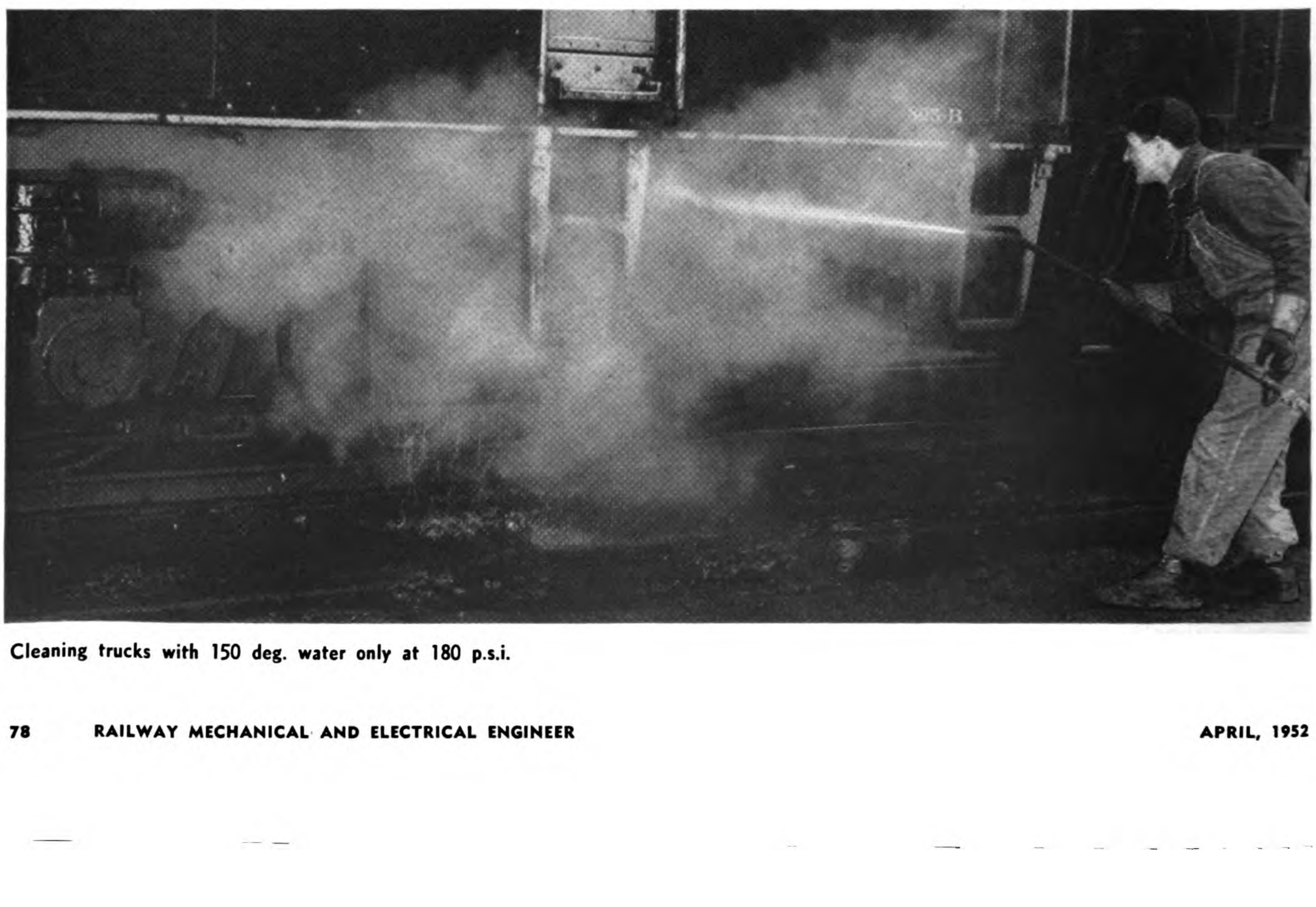
Material Charges—Adjusted in line with recent quotations resulting in some minor changes. Where Stores Department cost is chargeable, show the price, account and reference numbers on Repair Card.



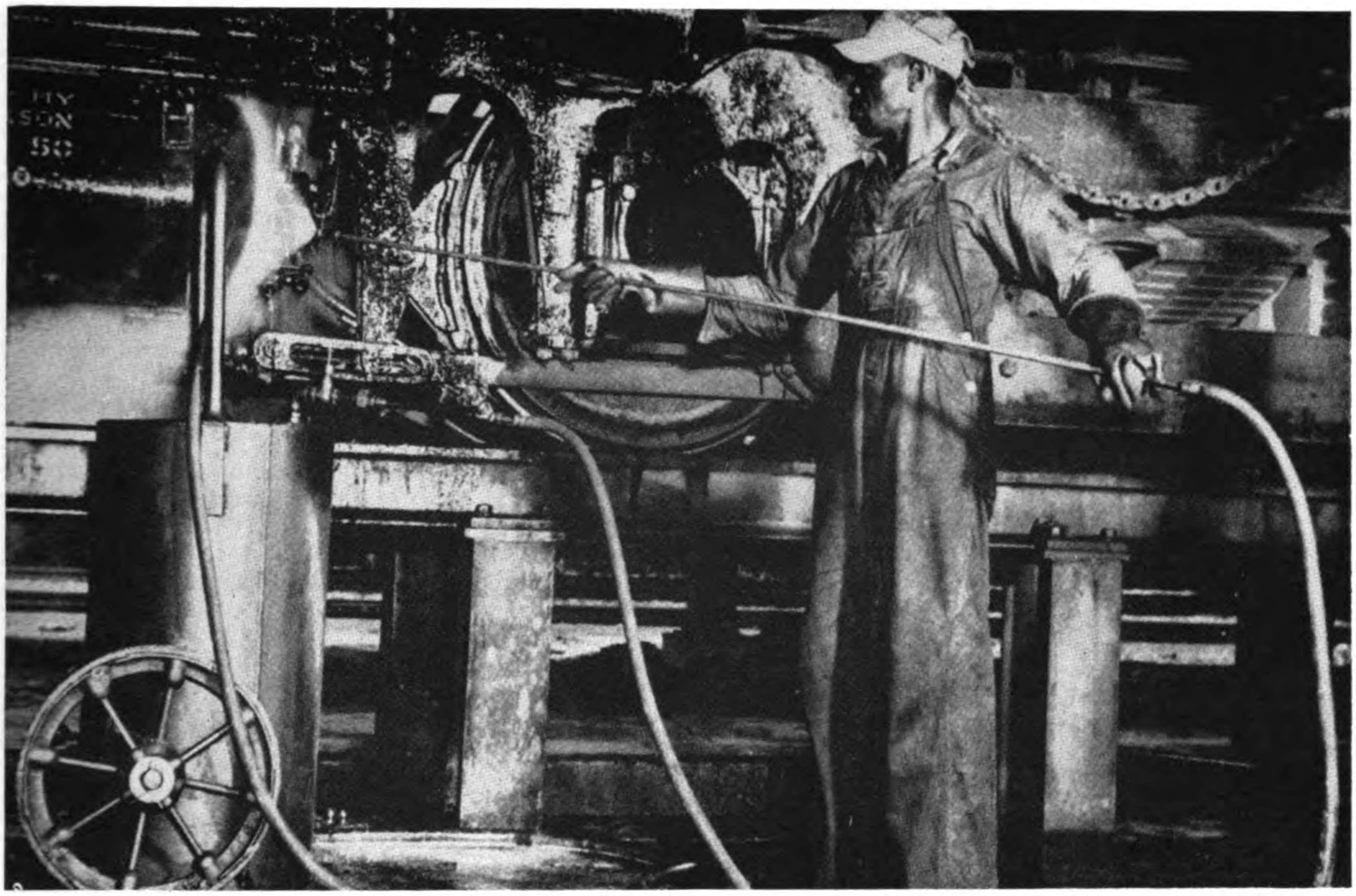
Ten full-length dome observation-lounge cars will be constructed for the Chicago, Milwaukee, St. Paul & Pacific by the Pullman-Standard Car Manufacturing Company beginning early this summer. The cars will have an overall length of 85 ft. and a height of 15 ft. 6 in. from the rails. The trucks will be six-wheel, with a 6½-in. by 12-in. journals. The heat-resistant curved safety glass roof panels will measure more than 3 ft. wide and 5 ft. high. The air-conditioning observation-dome section will seat 68 passengers. Beneath the dome will be a dining and lounge section seating 28, with an all-electric stainless-steel kitchen. A portion of the lower level space over the trucks will house air-conditioning equipment, air compressors, diesel enginators, and fuel and water tanks. The housing of this equipment is so designed that the equipment can be serviced regardless of weather conditions, or whether the train is standing or moving. Each car is thus mechanically independent.

Hand washing the exterior of a diesel locomotive unit.

Standardized Diesel Cleaning Pays



Cleaning trucks with 150 deg. water only at 180 p.s.i.

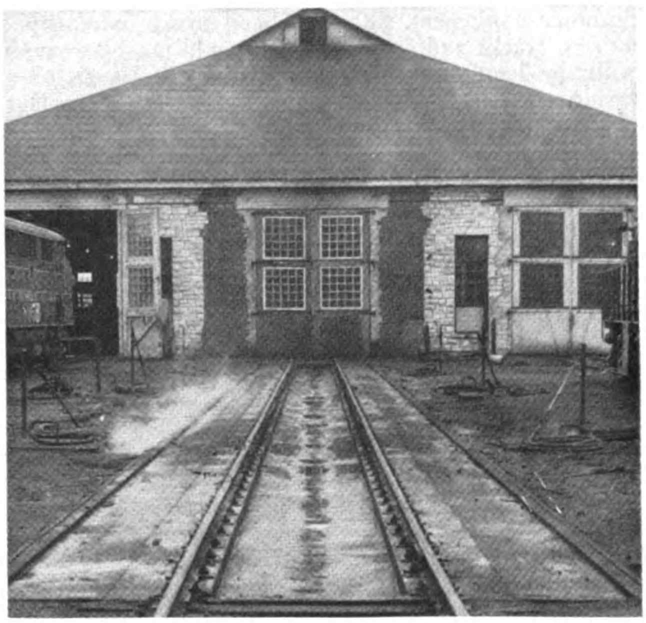


Applying cleaning solution to diesel under carriage

Dividends on the G. M. & O.

Easier inspection, fewer failures and a saving of $165,000 on three-year insurance premium are reported as a result of improved methods.

By Wayne Lasky
Engineer of Tests, Gulf, Mobile & Ohio, Bloomington, Ill.



Concrete wash track at the Bloomington diesel house

The Gulf, Mobile & Ohio does not intend to infer that it has the cleanest diesels in operation. However, the over-all improvement in cleanliness during the last two years has been remarkable. At one time, many exceptions were being taken by federal inspectors and occasionally it was necessary to hold diesels out of service until the hazards were eliminated. Recently a two-week

Abstract of a paper presented at the Southern and Southwestern Railway Club, March 20, 1952

Flushing the ceiling of an Alco diesel unit

survey was made of all the diesel power on the railroad by a fire prevention engineer from the Railroad Insurance Association. Management announced that the 3-year fire insurance premium on the diesels involved had been reduced $165,000, or a saving of $55,000 a year. The over-all diesel cleaning program along with the diesel lubricating oil control program were credited as the two items having the most influence on this reduction.

Tested Cleaning Methods

The G. M. & O. is completely dieselized, having operated its last steam locomotive in October, 1949. After becoming fully dieselized it was realized that the cleanliness of diesels was far from satisfactory although the total cost of cleaning, mostly labor, was excessive.

In the engineroom many places, not readily visible to the eye at casual inspection, harbored heavy accumulations of oil, grease and dirt which had not been cleaned due to their inaccessibility for hand cleaning. Such places as the Vee of the engine, back of the individual fuel pump on Alco units, portions of the air compressor, air brake equipment, filter tank and many inaccessible corners, cracks and crevices which could not be cleaned easily by hand, were being satisfactorily cleaned only during overhaul and were definite fire hazards. Our housekeeping at that time reminded us of the housewife that sweeps the dirt under the carpet and piles everything loose into the closets to get it out of sight and hurriedly flips a dust rag here and there scattering the dust. I.C.C. federal inspectors were beginning to give the railroad defects due to some of the dirty conditions existing.

Although trucks and underframes were being washed quite frequently, heavy sludge deposits on and around the diesel fuel tanks, and other deposits on the running gears and underframe were potential fire hazards.

Running gear and wheel inspections were not efficient at times due to the accumulation of dirt on the parts involved. The morale of shop forces responsible for inspections and repairs was at a low ebb due to the handicaps of working on dirty equipment.

It was decided to make a thorough survey of the entire railroad, studying the availability of diesels at the different terminals for maintenance and also the man power available to perform the work. A study was also made of the different cleaning materials and the methods of application, giving preference to cleaning equipment and materials which would clean satisfactorily with a minimum amount of hand labor.

Cleaning compounds were selected which showed little corrosive action on metals and caused a minimum of deterioration to painted surfaces when used at any concentration. Compounds which proved toxic, irritating to the skin or lungs and appeared likely to develop into health hazards were eliminated from consideration.

Fourteen terminals were selected to perform heavy cleaning on diesel units, the cleaning program or cleaning procedures being divided into three major items or classes: (1) Exterior carbody; (2) underframe (trucks, traction motors, fuel tanks, etc.); (3) interior (engine room—diesel engine—accessories and cab).

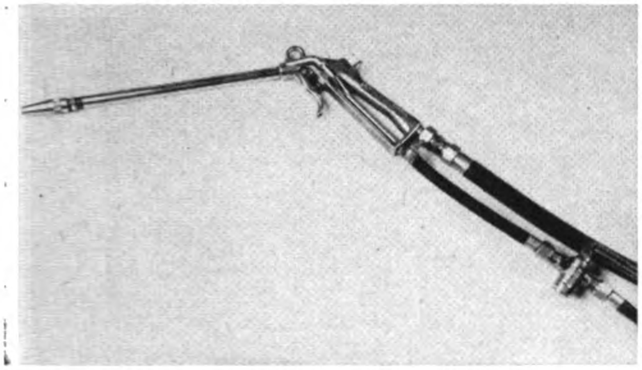
Cleaning the Exteriors

It was found that diesel locomotive exterior carbody cleaning could be satisfactorily accomplished either by machine washing or hand washing. Where car-washing equipment is available, locomotives can be washed by passing the diesel units through the car washer. Inasmuch as the primary use of the car-washer equipment is for washing passenger cars, we did not make any changes in the washing procedures, using the same cleaning material and rinses as used for passenger cars. It was found beneficial, however, to have hand labor scrub the nose and aprons of the diesel in between the application of the cleaning material and the water rinse as the brushes on washer did not contact these surfaces.

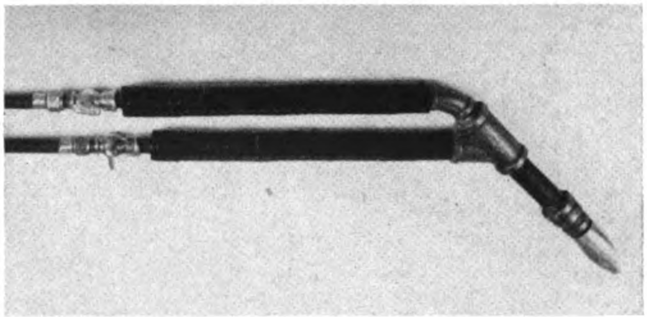
About 90 per cent of the diesel units were not available for washing in the car-washing equipment, so hand washing procedures were adopted as standard at most terminals.

Two basic type cleaners have been found satisfactory, either the acid type or the mild-alkaline type. If the exterior surfaces of the units do not become excessively greasy or oily, the acid-type cleaner is effective for removing the dirt, road film, brake shoe and rail dust, etc. If the exterior surfaces collect considerable oil and grease the mild alkaline-type cleaner has been found beneficial, but continued use does not result in as bright a surface finish or gloss as the acid type. All of the acid-type cleaners we have tested, however, are corrosive to metals. Those with a base of sodium acid sulphate have been found considerably more corrosive than those using oxalic acid. This has been shown both in laboratory tests and results from use in the field. Due to the corrosive characteristics of all acid-type cleaners, some railroads have adopted the practice of pre-wetting all the exterior surface with water before the cleaning solution is applied. With this procedure, plain water will enter all the cracks and crevices and any acid entering later will be considerably diluted.

An example of the effect of the corrosive action of some types of exterior cleaners is clearly illustrated by experience at the G. M. & O. passenger car terminal in Chicago. A new car-washing machine was installed and placed in operation in July 1947, using a sodium-acid-sulphate type cleaner. In July 1949, after two years service, it was necessary to replace the two large solution tanks which were leaking badly and were corroded beyond repair. It was also necessary to replace most of the piping handling the cleaning solution. During the two years of service the maintenance forces were constantly replacing valves, elbows, nipples, etc., at considerable expense. Inspection of passenger cars showed considerable corrosion, especially under the side sheets and around the vestibules.

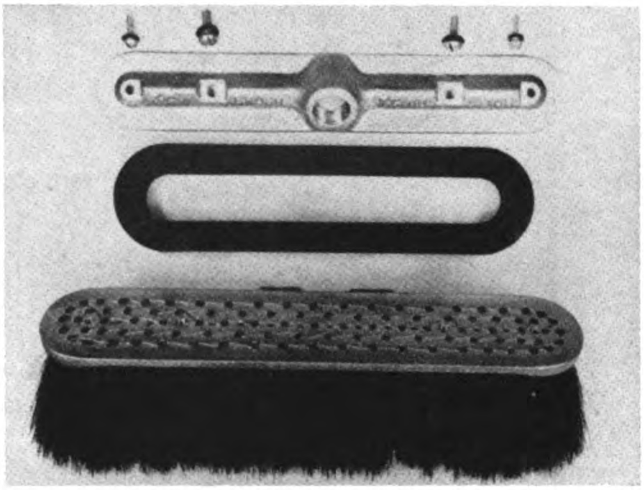


Air-operated vacuum pick-up type spray gun



Spray gun. All pipe fittings except nozzle and valves

Nozzle used in spray gun made of pipe fittings



The fountain brush disassembled

The machine was placed back in service in August, 1949, using an acid-type cleaner which had been found considerably less corrosive to metal. Since that time repairs and replacements to this equipment due to corrosion have been negligible.

The type of exterior finish on the diesel locomotives also enters into effectiveness of cleaning procedures to maintain clean and attractive diesel exteriors.

Most diesel units, as received from the engine builder, are painted with lacquer, said to be used in preference to enamel due to production line methods. Tests have shown that the general exterior paint condition of a diesel unit can be maintained for longer periods if painted with enamel and topped with a protective coating of varnish. The cost of repainting units with enamel and varnish also is less than with lacquer, mainly due to reduced over-all labor involved. Some protective coatings are now available which can be sprayed over lacquer finishes and extend the life of the lacquer considerably. Field tests over 1½ years have shown these protective coatings to be practical and economical. Painted surfaces with protective coatings appear to collect less soil and are more readily cleaned.

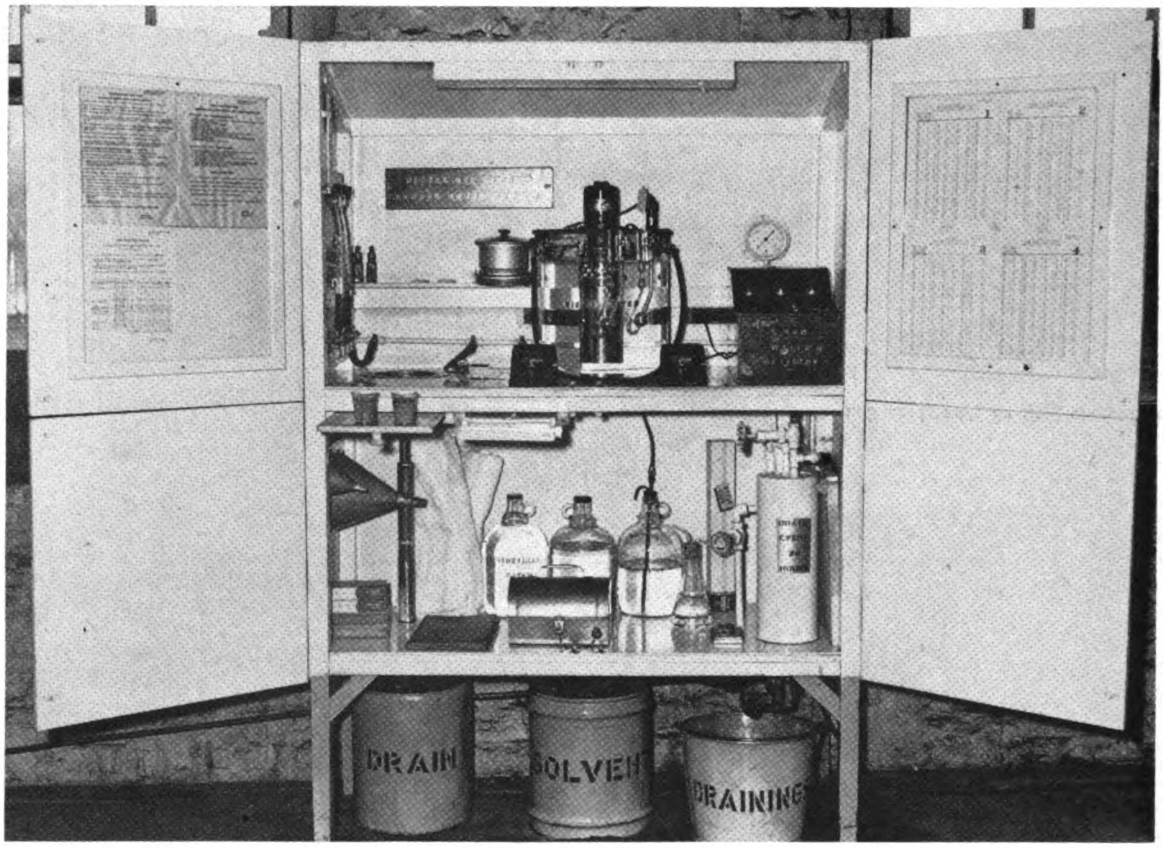
Underframe Cleaning

In addition to the over-all appearance of the trucks, traction motors, fuel tanks, battery boxes, etc., poor housekeeping of the underframes or running gear contributes to fire hazards and prevents effective pit inspections. Heavy accumulations of oil and grease on the running gear offer excellent opportunities for fire to start and cause extensive damage. Accumulation of grease, oil and dirt on the vital parts to be inspected can obscure defects and tends to promote careless inspections by maintenance personnel. Rigid inspections are necessary to prevent costly failures.

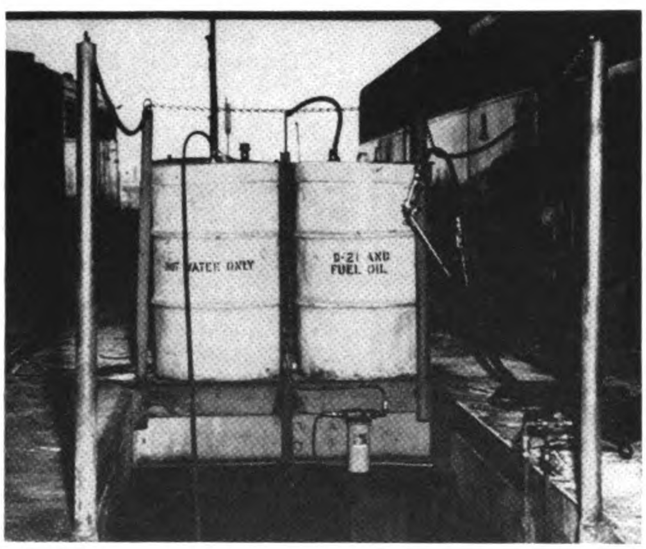
Recently a serious derailment was experienced near Muncie, Ind., in which 14 employees and 59 passengers were injured. Investigation showed the derailment to have been caused by a broken diesel wheel. Good housekeeping will keep these parts clean so that cracks and defects can be seen at time of inspection and the defective part removed before failure.

The survey on the G. M. & O. showed only a few terminals where adequate underframe or truck-cleaning facilities were available. Many terminals did not have adequate steam or hot water, so a cleaning method was required which would be applicable without these items.

A method was adopted using an emulsifying-type grease-solvent cleaner mixed with diesel fuel oil, applied lightly to the underframe by means of a pressure tank and fan-type spray nozzle. The solution is allowed to soak for a short period and then the cleaner and soil are flushed off with water at as high a pressure as available, using hot water whenever facilities permit.



Diesel crankcase oil and cooling system water-control cabinet installed at 15 terminals on the B. M. & O.



Ramp at Porter shops, Mobile, showing diesel cleaning equipment

However, it has been found that satisfactory cleaning of the running gear of diesels can be accomplished without the use of any chemical cleaning compound, if it is possible to have an abundant supply of hot water at a very high pressure. At the present time our most satisfactory and most economical cleaning is being accomplished with only the use of water at about 150 deg. F., at a pressure of 180 p.s.i. The hot water at this pressure will satisfactorily remove all grease, oil and dirt accumulation.

It will also remove any paint that is not well bonded to the metal or has been applied over a dirty surface. The parts can be cleaned satisfactorily enough for repainting after drying. In some instances a thin gray or brown "road film" will remain on the painted surface which is only objectionable from the standpoint of appearance. One of several different chemicals can be lightly sprayed on the affected parts and a quick flush will bring back the paint luster.

One view shows truck cleaning equipment in operation. The average time required for one man to clean the running gear, underframe, fuel tank, traction motors, etc., is about 30 min. The maximum hot water delivered at each station varies from 28 gal. per min. to 30 gal. per min. depending on the number of stations in service at one time.

Diesel Interior Cleaning

Engine-room cleaning had previously been accomplished by hand wiping, with occasional hand washing of the ceilings and the walls. Many places in the engine room or around the diesel engine and its accessories can not be reached by this method. Some points of potential fire hazards in the engine room were just not being cleaned. The over-all cost of engine-room cleaning, mostly labor, was excessive due to the time required and yet the engine rooms were not satisfactorily clean.

The method adopted for engine-room cleaning consists of spraying the entire engine room, ceiling, walls, engine, accessory equipment and floor with the same emulsion-type cleaner as used on the underframes. The material is allowed to soak and the dirt and cleaner rinsed from the surfaces with a hot water spray. The same spray gun is used both for application of the clean-

ing solution and rinsing with hot water. It is an air-operated vacuum pick-up type spray gun which applies the cleaning solution and the water with considerable force. The cleaning compound is not toxic, non-irritating to the skin and non-injurious to paint. It is mixed with fuel oil before using, the concentration of the cleaner depending on the dirtiness of the engine-room parts.

If the entire engine room is to be cleaned, canvas covers are placed over several parts of the electrical equipment to prevent damage, the carbody air filters removed, all doors opened and air movers installed in the diesel unit. The cleaning solution is applied first to the ceiling or upper portion of the engine room, working downward until all portions have been thoroughly sprayed. Hot water is then used to flush all dirt and cleaner to the floor. If the soil on the ceiling and walls is heavy and consists of mostly dry carbon it may be necessary to loosen the soil by scrubbing before rinsing.

The characteristic of soil on the engine, air-brake equipment, filter tank, oil cooler, compressor, etc., is such that wiping or scrubbing is not usually necessary. Flushing with water usually leaves these parts satisfactorily clean. The spray gun can be used for directing much of the soil, which has been washed to the floor, down the drains or out into the aisles where it can be more easily mopped up. Such items as the air compressor and air-brake equipment formerly required eight man hours to hand wash satisfactorily. It was found possible to do the same job in about one hour using the spray-gun method.

In one illustration, the operator is seen flushing off the ceiling of an Alco locomotive. He is seated on top of the engine and it will be noted that he is wearing a respirator and rubber gloves as safety measures. In spraying diesel engines between cylinder heads and in behind fuel pumps, some points are not accessible for hand cleaning and others cannot even be seen. Cleaner solution is sprayed until the solution draining from behind these parts no longer appears dirty.

Cleaning Time Required

Shortly after the program was started the average diesel unit required approximately 1¼ man hours for exterior carbody cleaning, 1¼ man hours for the underframe and about 20 man hours for cleaning the engine room. However, more often than not the diesel unit could not be held long enough to clean the entire engine room, especially if other maintenance or repairs were necessary. In many instances, the carbody and underframes need cleaning several times before the engine room requires cleaning again. It was therefore necessary to divide the engine-room cleaning into several sections such as the roof, sidewalls, accessory housing, turbocharger, filter tank, air compressor, oil cooler, blower drive housing, air brake equipment, steam generator, etc.

On one trip into a cleaning terminal, a few of the items can be cleaned during the time available. Other sections of the engine room can be cleaned on successive trips. The mechanical foreman in charge is responsible for inspecting the unit and designating the items in the engine room to be cleaned. Forms have been printed including all of the different items on the cleaning program. After any cleaning work is performed on a diesel it is checked off on the form and forwarded to a central office where a composite report is tabulated. Thus the progressive cleaning of any diesel can be followed and the work accomplished by each terminal evaluated.

These reports have disclosed many odd conditions and made it possible for them to be corrected. For instance, some diesels were having the roofs and sidewalls cleaned frequently but the engine, air brake equipment, compressor, etc., were being neglected. Some units were being cleaned as frequently as five times as often as other units. This condition of course was aggravated, inasmuch as most road diesels do not have a definite home terminal and the responsibility of maintenance and cleaning is shared between as many as eight or nine terminals.

As the cleaning program progressed and over-all cleanliness of enginerooms improved, the man hours and the cleaning material required decreased. Recent surveys indicate from 10 to 15 man hours are required to clean an entire engine room.

An air-operated vacuum pick-up type gun, in use for the past two years, has been satisfactory although, like any piece of equipment, it is subject to failure. The inner wall of the hose although made of neoprene rubber, may disintegrate allowing small pieces of rubber to plug the gun. The cleaning solutions and hot water must be kept free of dirt, lint, etc., for the same reason. The nozzle, if it becomes battered and out of shape, will not allow sufficient vacuum pick-up.

Field tests of another type of gun show considerable promise. This is a spray gun made entirely of pipe fittings with the exception of the nozzle which produces a fan-type spray, of water only, and reduces the time required for water rinsing about 15 to 25 per cent.

Oil Control Program

Inasmuch as the diesel crankcase oil control program has also been credited as having a part in the reduction of fire hazards, the following is a brief outline: A control cabinet, illustrated, is installed at 15 major terminals on the railroad. The apparatus it contains for checking oil quality includes one of the more accurate type viscosimeters operated at 100 deg. F., a sensitive water detector for determining the water content in the oil, if any, and the conventional blotter spot-card test. Many special features have been developed and incorporated in the cabinet to make it possible for non-technical personnel to operate this equipment efficiently. The equipment is operated by diesel house personnel, usually the general mechanical foreman or the mechanical shift foreman.

Road diesels are sampled every time they arrive at each terminal diesel house. This results in every engine being sampled at least once every 24 hr. and some engines more often, depending on the assigned runs. It requires a total of only 15 to 18 min. to check both the cooling water and the crankcase oil from four diesel engines. The diesel units are held during these tests and not dispatched until the oil and water have been O.K.'d by the foreman. If any unsatisfactory conditions are found they are corrected before dispatchment. The results of all tests are forwarded daily to the central laboratory where a running record of the analyses is maintained on each diesel engine.

By this frequent checking of the oil, serious fuel dilution has practically been eliminated. Excessive fuel dilution can cause seizure of pistons or distress to bearings, either of which will furnish the necessary "hot spot" conducive to crankcase explosions and fires.

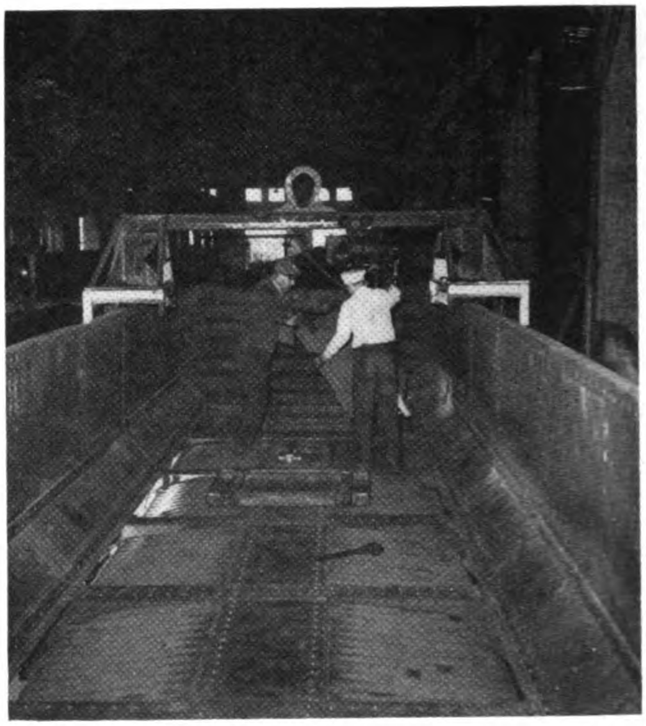
At present we are averaging about 6,000 oil samples analyzed per month. This is checking oil more frequently than customary on most railroads. However, we believe it to be essential for economical operation. The initial cost of the program was not large. The upkeep or maintenance of the program is negligible. The dividends returned have been considerable in greater availability of diesels and in the reduction of costly failures.

Portable Gantry Helps In Car Repairs

A portable gantry crane has proved helpful in program repairs to a series of drop-bottom gondola cars at the Union Pacific shops, Omaha, Neb. It consists of two A-frames, each equipped with two wheels to bear on the top chord angle of one of the car sides and connected at the top by a 6-in. I-beam with center plate cut out for engagement with the crane hook.

The wheels in each A-frame are double-flanged, spaced about 30 in. on centers and mounted with a sliding fit on axle support bars so they can follow any irregularities in top chord angles as the gantry is moved along the length of the car. The 6-in. I-beam is equipped with an overhead trolley and ½-ton air hoist. Leg extensions on each side of the A-frames serve as a precaution against the gantry accidentally dropping off the car.

In operation, a set of 14 reconditioned drop doors is placed in the car with the shop crane. The small gantry crane is then used to drop these doors, one at a time, diagonally through the door openings and then pull them up into place while hinge pins are applied and the doors secured. This was formerly a long, hard job and somewhat hazardous as well. By use of the small gantry, a complete set of 14 doors is now applied in about 30 minutes.



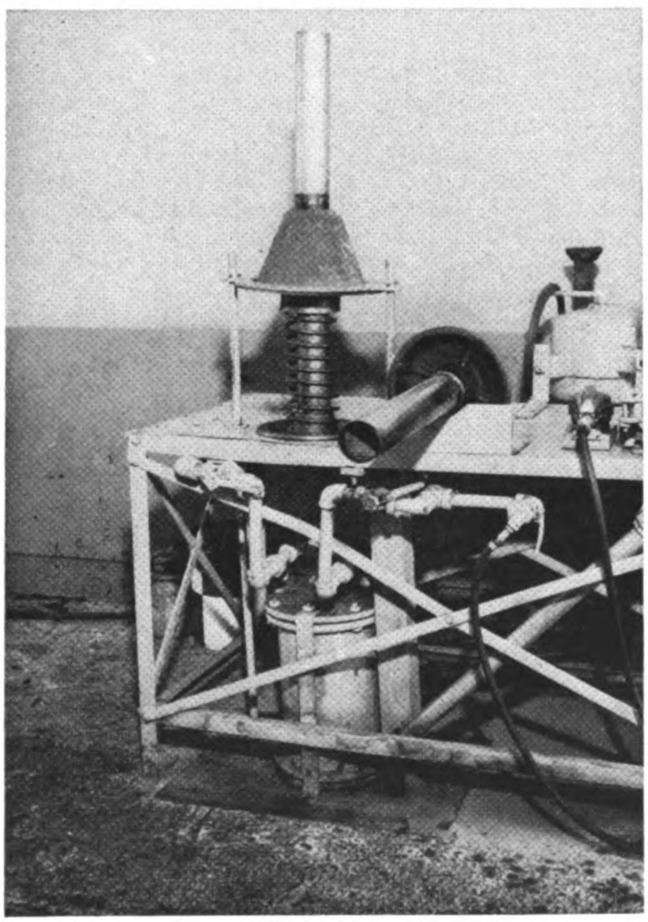
Portable gantry crane being used to install drop doors in gondolas

Better Working Height For Non-Pressure Heads

A somewhat different device than that used by most roads for assembling and disassembling AB pistons is employed by the T. P. & W. To place the non-pressure head in a more convenient position for removing the collar and other work, it is forced down to compress the spring by a pair of ¾-in. rods protruding upwards through a bench, the force being applied through a plate shaped approximately to the contour of the flange. The plate is held in place relative to the rods by ⅜-in. pins through holes in the rods.

This arrangement not only puts the non-pressure head at what is considered to be a more comfortable and convenient working height, but it puts everything in the open where the workman can more easily get at the parts. The movement of the rods is actuated by an 8-in. air piston mounted at floor level. A clevis on the end of the air piston rod connects to the two ⅜-in. rods.

The piston rod of the non-pressure head is cleaned just to the right of the assembling arrangement. The rod rests in a semi-circular hole in a plate mounted vertically on the bench, and is cleaned by an air-operated vibrating sander. The plate is of such a height that with the hole cut out for the piston rod, the rod is in a horizontal position and is easily turned for cleaning around the entire circumference.



Arrangement for working non-pressure heads at a comfortable working height and with everything in the open. The piston at the right is to be cleaned with the vibrating sander.

QUESTIONS AND ANSWERS

Diesel-Electric Locomotives*

Lubricating Oil System

401-Q.—How is the lubricating system related to the locomotive unit? A.—The engine in each locomotive unit contains its individual lubricating system.

402-Q.—How does the lubricating system function? A.—All working parts are pressure lubricated.

403-Q.—How is the pressure supplied to the system? A.—By means of a gear type pump, gear driven from the engine crank shaft.

404-Q.—With respect to lubrication, under what type is the engine classified? A.—It is classified as a wet sump type.

405-Q.—Why is the engine so classified? A.—Due to the fact that all of the lubricating oil is stored in the engine base.

406-Q.—What is the condition of the oil in the engine base after it has circulated through the system and why? A.—The oil is hot and dirty. It has cleaned and lubricated the various working parts on its course through the engine.

407-Q.—What must be done before the oil is returned to the engine? A.—Means must be provided to clean and cool the oil before it is returned to the engine.

408-Q.—How is this operation initiated? A. — With the engine operating, the lubricating oil pump draws this hot and dirty oil from the base and discharges it to the system under high pressure.

409-Q.—What means are provided to limit this high pressure? A.—This pressure is regulated by a pressure regulating valve mounted in the pump discharge line.

410-Q.—What is the next step? A. — The oil is then passed through a filter where it is cleaned.

411-Q.—Is the oil now ready for use? A.—No. It is still hot.

412-Q.—What must be done to overcome this condition? A.—The oil is piped to a cooler where a portion of the heat is absorbed by the engine cooling water.

413-Q.—From the cooler, where does the oil pass to? A.—It is piped to a strainer where any remaining impurities are removed and then delivered to the main header of the engine.

414-Q.—What connection is made just before the oil enters the main header? A.—A portion of the oil is piped to the valve lever mechanism, cam shaft bearings, gear trains and turbo-supercharger bearings.

415-Q.—Where does the oil finally lead to? A. — It is returned to the engine base through various drain lines.

* This series of questions and answers relate specifically to the Alco-G.E. Diesel electric locomotives.

416-Q.—How are the main bearings lubricated? A.—Individual jumper pipes conduct the oil from the main header to each main bearing.

417-Q.—How does the lubrication get to the connecting rod bearings? A.—Drilled passages in the crankshaft allow the oil under pressure to flow from the main bearing journals to the connecting rod bearing journals.

418-Q.—In what manner are the piston pin and bushing lubricated? A.—From the connecting rod bearings, the oil passes up through rifled drilled connecting rods to hollow full floating piston pins, lubricating piston pin and bushing.

419-Q.—How is cooling of the pistons provided? A.—Through a passage in the main pistons, oil flows from the piston pins to oil cooling grooves in the pistons, terminating in an outlet hole, and draining back to the engine base.

420-Q.—What protection is afforded against loss of lubricating oil pressure? A.—At the end of the main engine header, a line leads to the engine control panel terminating in a pressure gauge and two low oil pressure switches which protect the engine against loss of lubricating oil pressure.

421-Q.—What is the total system capacity of oil? A. — 200 gallons on the 1500 h.p. Road Switcher and road Freight, and 230 gallons on the 2000 h.p. Road Passenger locomotives.

422-Q.—How is the system filled? A. — To fill the system, any engine base door can be removed and the oil poured through this opening.

423-Q.—How is additional make up oil supplied? A. — A filling connection is supplied at the free end of the engine for the addition of make up oil.

424-Q.—What precaution must be taken when about to fill the system? A.—Never remove a base door while engine is operating, as hot oil thrown from the operating parts may cause personal injury.

425-Q.—How is the system drained? A. — By removing a pipe cap from an external drain pipe and the drain plug in the engine base. In addition, there are three drain valves to open, one for the strainer and two for the filter.

426-Q.—How do we determine when oil should be added? A.—A Bayonet gauge is provided, with a high and low mark to indicate the oil level.

427-Q.—How often should the gauge be checked? A.—It should be checked daily.

428-Q.—What conditions should prevail at the time the check is made? A.—The engine idling, on a level track, crank case exhauster shut off and oil temperature near normal.

429-Q.—How should the level be maintained? A.—The level should be maintained between the High and Low mark, preferably at the High.

430-Q.—What precaution must be taken after an oil check has been made? A.—Make certain that the crank case exhauster is turned on and operating.

431-Q.—What must be done if the lubricating oil is found to be above the base screens with the oil level at the high mark on the gauge? A.—The markings on the bayonet gauge should be checked and re-marked.

432-Q.—How should the gauge be marked? A.—*High* mark 9⅞ inch from the shoulder at the knob end of the gauge. *Low* mark 12⅞ inch from the shoulder at the knob end of the gauge.

Schedule 24 RL

Air Brakes

1284-Q.—In the event that a locomotive is detached from a train and is being moved in FRGT position, what should be done if an emergency arises?

A.—Move automatic brake valve handle quickly to emergency position.

1285-Q.—What movement should then follow?

A.—Quickly move the independent brake valve handle to full application position to nullify the controlled emergency feature.

1286-Q.—Should the independent brake valve handle be kept in this position?

A.—Yes. Until the stop is completed or the emergency has passed.

Suggested Procedure When Pipes Are Broken—Automatic Brake Valve

1287-Q.—What function is lost if the equalizing reservoir pipe 5, is broken?

A.—The functions of service position are lost.

1288-Q.—What repairs to the pipe should be made?

A.—Close pipe to brake valve by a plug or a short close bend.

1289-Q.—What other opening should be plugged?

A.—Close brake pipe exhaust one-half inch with pipe plug or well fitted hard wood plug.

1290-Q.—Can the brake be applied?

A.—Yes.

1291-Q.—How can the brake be applied?

A.—Move the brake valve handle into the emergency position zone gradually, opening the emergency pilot valve only.

1292-Q.—What should be done if application pipe 10 is broken?

A.—If a service application portion is used, close cut out cock on front of brake valve.

1293-Q.—What operation is lost?

A.—Safety control, overspeed and train control operation.

1294-Q.—In the event that an emergency application portion is used, what must be done?

A.—Close cut-out cock if available, or close the pipe by a plug or close bend.

1295-Q.—What operation is thus lost?

A.—The functions of the emergency application portion are lost.

1296-Q.—What would be the result if brake pipe (No. 1) is broken?

A.—Locomotive and train automatic brakes are inoperative.

1297-Q.—Is a brake available on the locomotive?

A.—Yes. The locomotive independent brake is operative but the automatic brake valve handle must be placed in lap position.

1298-Q.—What should be done if control pipe 11 is broken?

A.—Cut out the electro-pneumatic brake and proceed, using automatic brake.

1299-Q.—In the event that governor pipe 29 is broken, what can be done?

A.—Proceed with high governor top in control.

1300-Q.—What must be done if the high pressure top governor pipe is broken?

A.—The compressor must be manually throttled to control the main reservoir pressure in first service, lap, service and emergency position.

1301-Q.—What must be done if safety control pipe 3 is broken between brake valve and foot valve?

A.—Proceed with safety control, controlled with the diaphragm foot valve only.

1302-Q.—Suppose that the pipe is broken between the foot valve and relayair valve unit?

A.—Close the cut-out cock on the service or emergency application portion or make a close tight bend to stop the leak.

1303-Q.—What feature is lost in this case?

A.—All functions of the application portion are lost.

1304-Q.—What action should be taken if sanding pipe 9 is broken between the brake valve and No. 15 double check valve (with brake-in-two protection feature)?

A.—Pipe must be repaired or manual brake valve sanding is lost.

1305-Q.—Suppose that a No. 15 check valve is not used?

A.—The break must be repaired or manual and automatic emergency sanding features are lost.

1306-Q.—What must be done if suppression reservoir pipe 23 is broken?

A.—Stop leak on brake valve side of the break by plugging or close tight bend.

1307-Q.—After plugging, what can be done?

A.—Proceed. Functions are the same as with rotair valve in *PASS*.

1308-Q.—What action should be taken if reduction limitating reservoir pipe 24 is broken?

A.—Close first service cut-out cock and proceed, using service position for automatic brake operation.

1309-Q.—Suppose that power cut-off pipe 25 is broken?

A.—Stop leak from the brake valve.

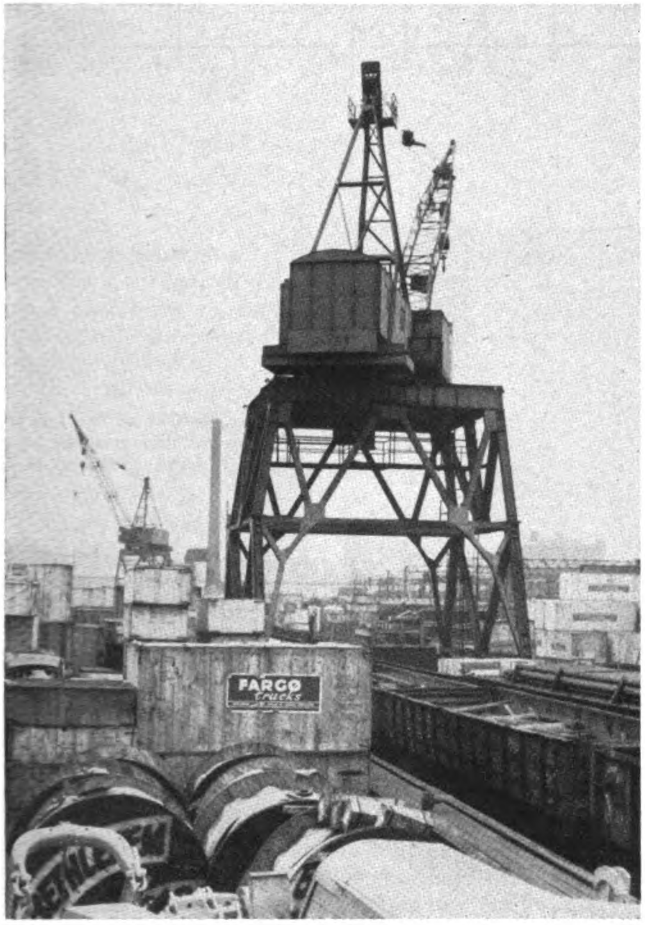
1310-Q.—What operation is thus lost?

A.—Power cut-off for any application portion operation is lost.

1311-Q.—What must be done if main reservoir pipe 30 is broken?

A.—Pipe must be repaired to have an automatic brake.

ELECTRICAL SECTION



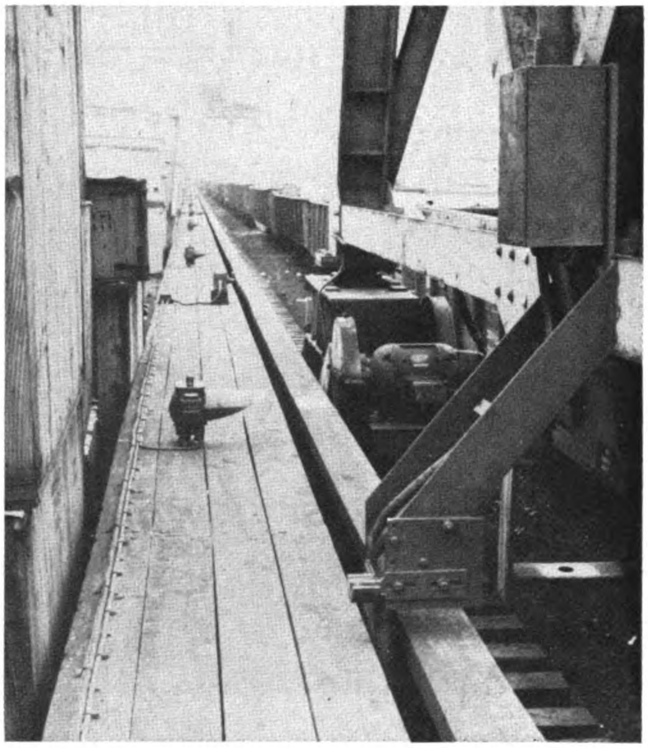


Fig. 1 (Left) — The Lackawanna's two 60-ton gantry cranes in its Hoboken, N. J., terminal yard

Fig. 2 (Above) — The tripping arm on the east crane is shown in the foreground. Along the platform are shown signal lights and one tripper switch. Three power contact rails for crane operation are enclosed by the platform and side housings

Lackawanna Develops Photo-Electric Crane Protection

Possible collision of two gantry cranes operating on the same track is prevented by means of a signal system using lights and photo-electric relays

THE DELAWARE, Lackawanna & Western employs two gantry cranes in its Hoboken, N. J., terminal yard to transfer lading from cars to barges or to storage in the yard. Barges to be loaded or unloaded are moved into a canal which is parallel and close to the crane runway. The two cranes operate on the same tracks. Distance between rails is 32 ft. and the length of the track is 1,550 ft. The cranes have a capacity of 60 tons at 60 ft., and are capable of lifting lesser loads at distances up to 125 ft. from the center of the crane.

Since the crane booms may be rotated 360 deg., it is not always possible for the operator to see the other crane. For this reason, it was necessary to devise some means of preventing a possible collision of the cranes. Track

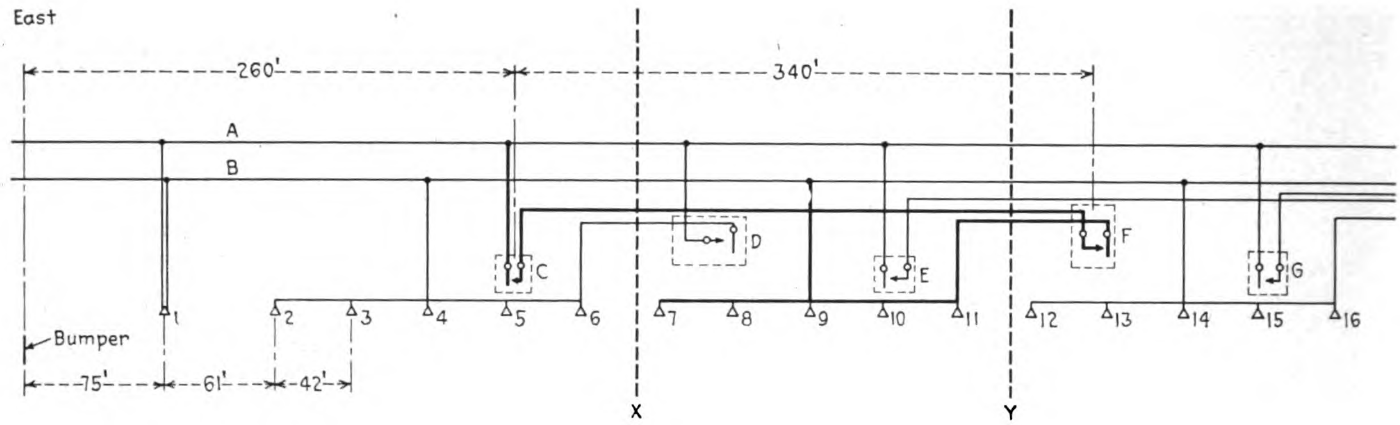
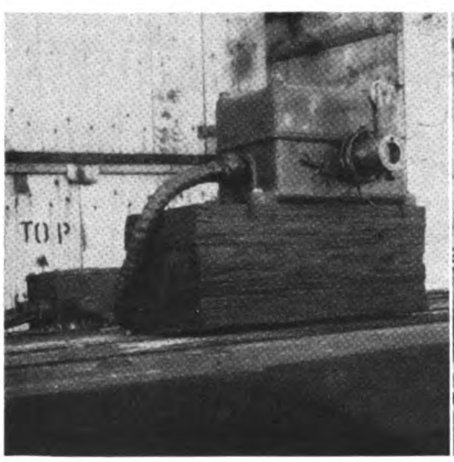
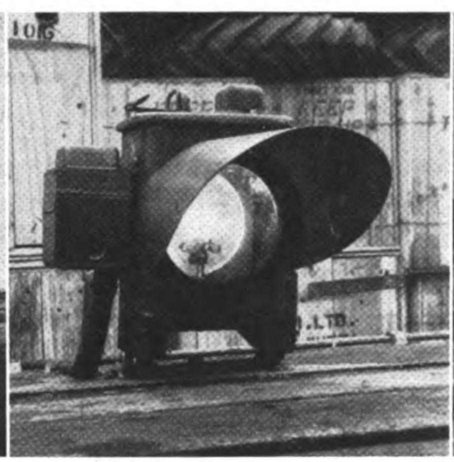
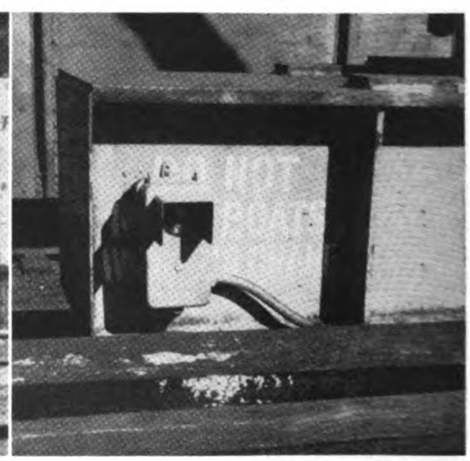


Fig. 4—One of the low tripper switches operated by the east crane and one of the lights

circuits could not be used, since the crane is operated by 440-volt a.c. motors, and it is necessary that the rails be grounded.

The requirement was met by a signal system employing mechanical trips, wayside lights and photo-electric relays. As either crane approaches the other, it sets up circuits by means of mechanically operated switches, until the cranes are within 340 ft. of each other. When this limiting distance is reached, five wayside lights between the two cranes are lighted. Then if either crane moves further toward the other, a photo-electric relay on the crane receives an impulse from the first light which energizes two flashing red lights in the crane operator's cab and two steady red lights outside the cab. The lights in the cab continue to flash as long as the cranes are within the limiting distance unless the relay is reset by the operator. They will start flashing again if he passes another light. As the cranes move away from each other, the mechanically-operated switches are opened by the movement of the cranes. This clears the intervening circuits, and the wayside lights are extinguished.

The manner in which this is accomplished is shown in

Left: Fig. 5—One of the high tripper switches operated by the west crane. Center: Fig. 6—A 25 c.p. signal light with its 115/6-volt transformer. Right: Fig. 7—The photo-electric relay on one of the cranes

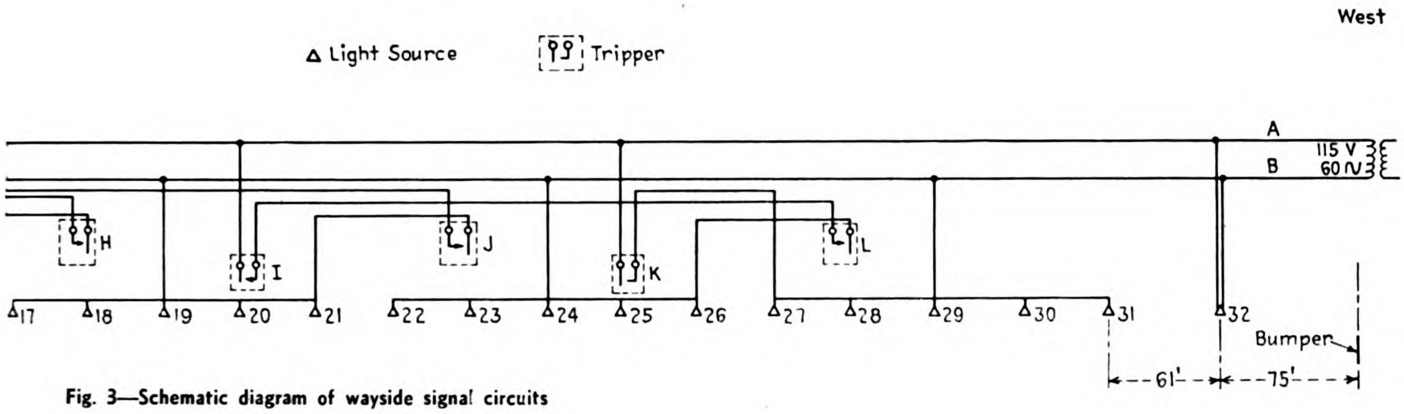


Fig. 3—Schematic diagram of wayside signal circuits

the wiring diagram, Fig. 3. The 115-volt, 60-cycle signal power lines *A* and *B* extend the full length of the crane track and serve to supply power to operate the lights Nos. 2 to 31 inclusive, through the tripper switches. The tripper switches *C*, *E*, *G*, *I* and *K* are closed by an arm on the east crane as the crane passes each switch going west. As it moves past each switch eastbound, the arm opens the switch. This arm is shown in the foreground in Fig. 2 and one of the switches it operates is shown in Fig. 4.

The west crane closes switches *L*, *J*, *H*, *F* and *D* as it passes them when moving east and opens them as it passes them while moving west. All of the switches operated by the east crane are mounted as shown in Fig. 4, while all of those operated by the west crane are mounted high as shown in Fig. 5, and the operating arm on the west crane is correspondingly higher so it will only operate the switches which are up on blocks. The switches are limit switches with a spring-return arm.

To follow the operation of the circuits, assume that the east crane has moved from the east end to the position indicated by the dotted line *X*, having passed and closed the switch *C*. Then assume that the west crane has moved east to the position indicated by the dotted line *Y*.

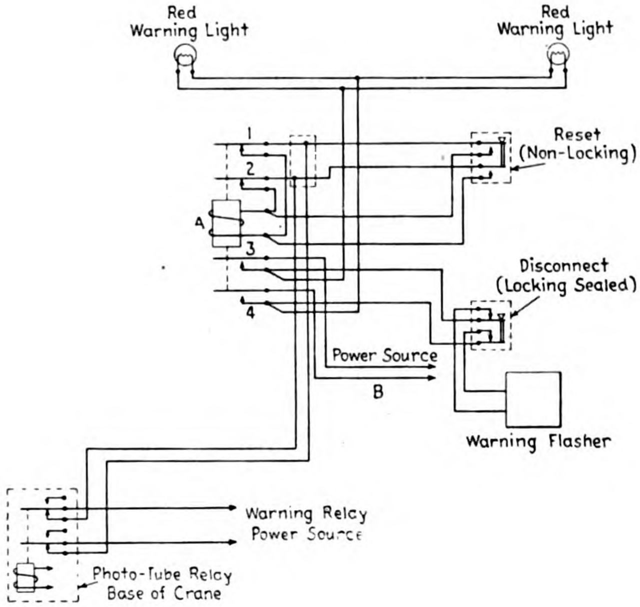


Fig. 8—Schematic diagram of the signal circuits of one of the cranes

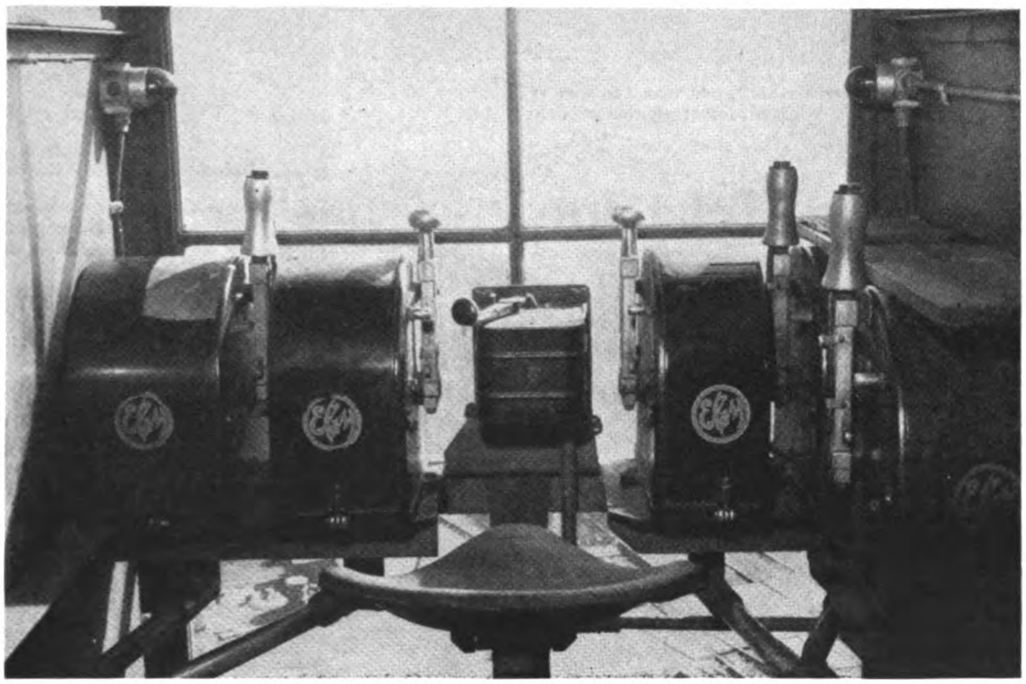


Fig. 9—The operator's position in one of the cranes showing the signal lights at the left and right of the window

As it passed the switch *F*, it closed it, causing wayside lights *7*, *8*, *9*, *10* and *11* to burn. One side of the line to the lights is energized through switch *C*, and the other through switch *F*. The completed circuit is shown by the heavy lines. One of the lights is shown in Fig. 6. The small transformer on the side of the lamp housing reduces the line voltage of 115 to 6 volts for the operation of the 25 c.p. lamp in the light unit.

Now, if the west crane moves farther to the east until its photo-electric relay (Fig. 7) comes in line with light No. *16* in the diagram, the relay trips and starts the warning lights in the operator's cab. Similarly, if the east crane moves west until its photo-electric relay is opposite light No. *7*, the operator of that crane will receive a warning signal. The distance between the lights and the photo-electric relays is about 4 ft. Accurate aiming of the lights is not necessary. The relays are general purpose outdoor type photo-electric relays with self-contained photo-tubes.

The signal circuits on the crane are shown in the diagram, Fig. 8. The contacts in the photo-electric relay, lower left, are normally energized, with contacts as shown. Solenoid *A* is in the upward position, and contacts *1* and *2* are closed. When the photo-electr.c relay receives an impulse from a light, its contacts are opened, and solenoid *A* drops down, closing contacts *3* and *4*, which connect the red warning lights to the power source *B*.

The operator may extinguish the red warning lights by pressing the reset (non-locking) button, but he will receive another warning if he should pass another light. In case of faulty operation, the operator may disconnect the lights with the disconnect switch (lower right), but this requires the breaking of a seal.

Fig. 1—With this portable hoist, one man can remove a battery tray from a locomotive battery compartment

Portable Hoist for Locomotive Batteries

A simple and effective device for removing or replacing battery trays in locomotive battery compartments has been developed in the Erie diesel locomotive shops at Marion, Ohio. It is of welded construction, and is made of steel angles and pipe.

The base is triangular and is mounted on three 6-in. rubber-tired wheels. The vertical members, as shown in the illustrations, are made of angles. The horizontal member at the top is made of steel pipe, and there is a grooved pulley or sheave at each end of this member. A steel cable with a hook at each end runs over these sheaves.

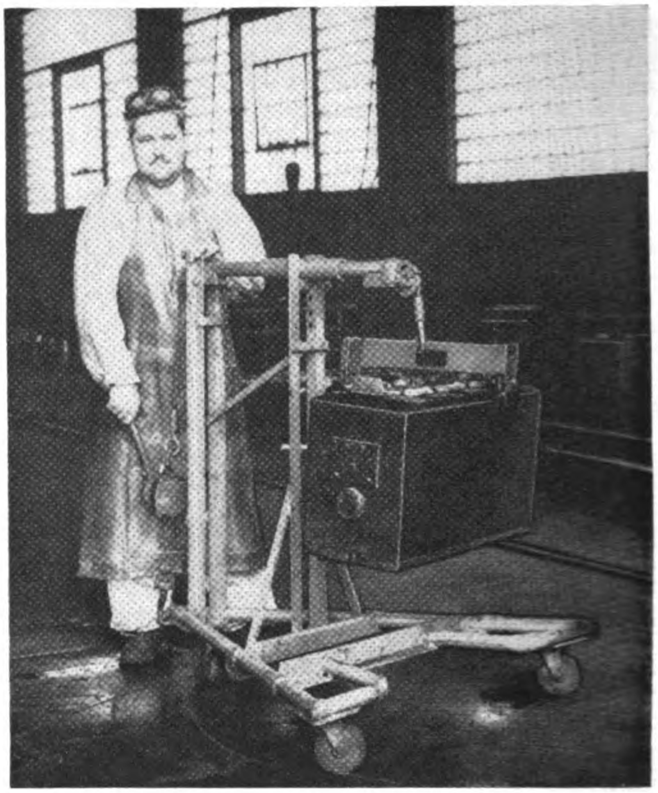
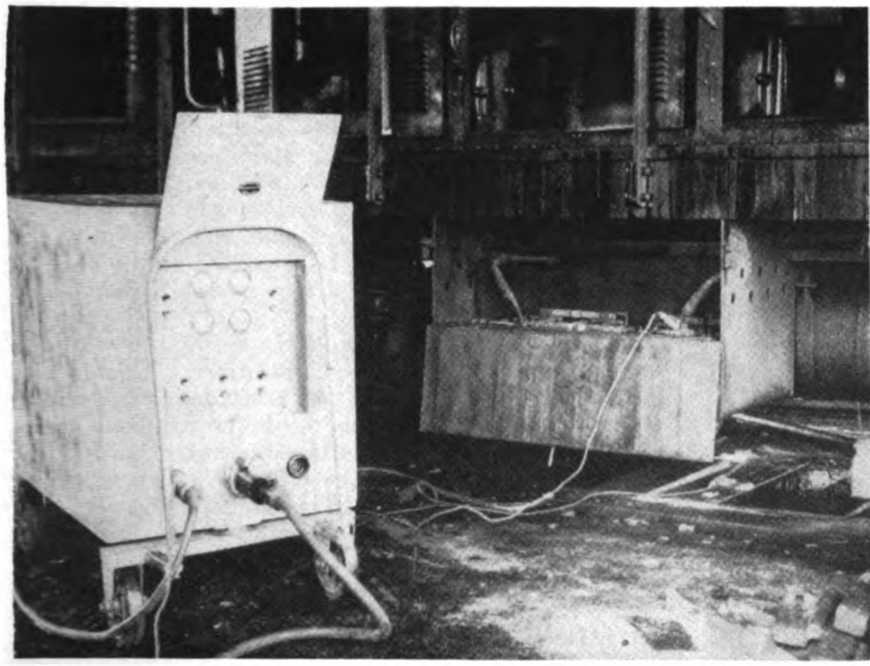
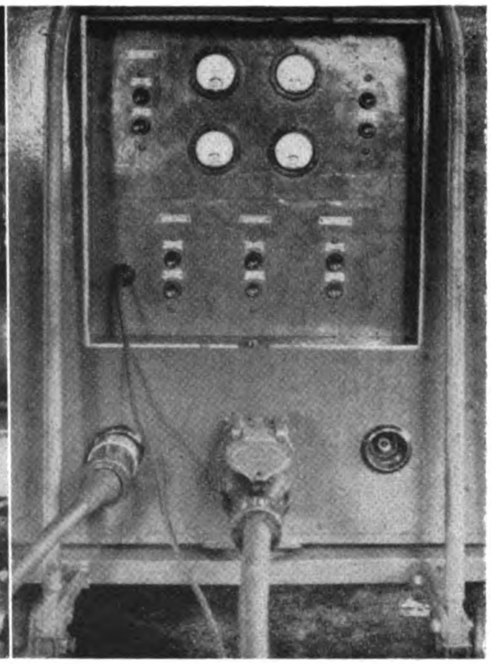


Fig. 2—After the tray is moved to the battery shop, the rectangular opening in the base provides a place to put a skid under the tray. All battery work in the shop is done with the trays on these skids

When a battery is to be lifted, a lifting bar, which may be seen in Fig. 2, is hooked to the lifting lugs on the battery tray. One end of the cable is hooked into an opening in the center of the bar and a ratchet hoist is hooked between the other end of the cable and the base of the device as shown in Fig. 1. Taking up on the hoist then lifts the battery tray, after which the battery may be rolled to the battery shop, as shown in Fig. 2. The rectangular opening in the base of the device permits lowering the battery tray to the floor or placing it on a battery skid on which it is overhauled. By reversing the operation, a battery may be replaced in the locomotive battery compartment.

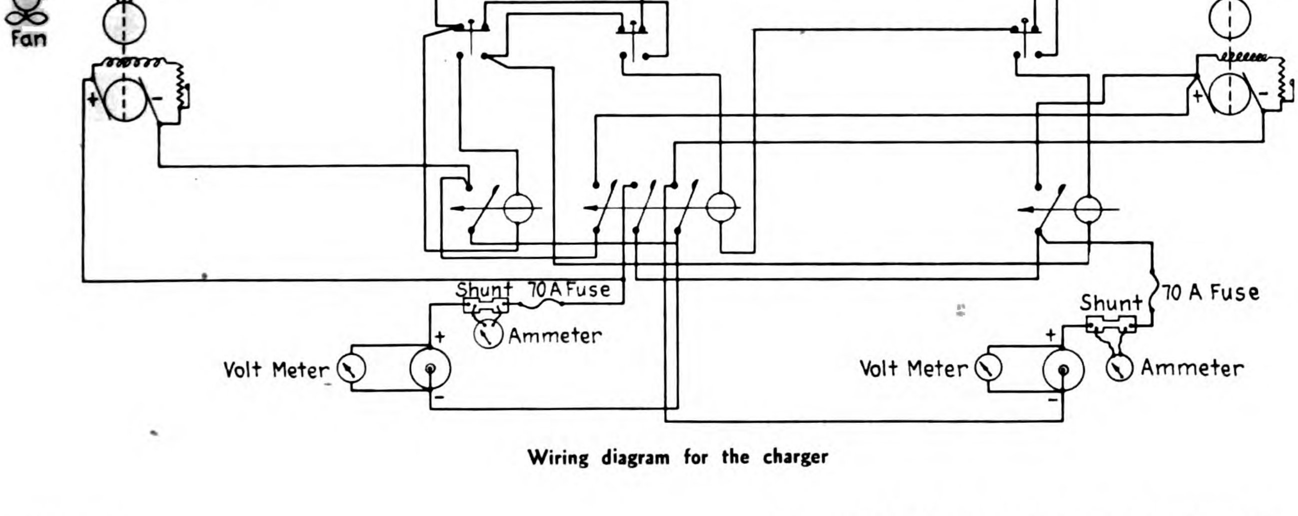




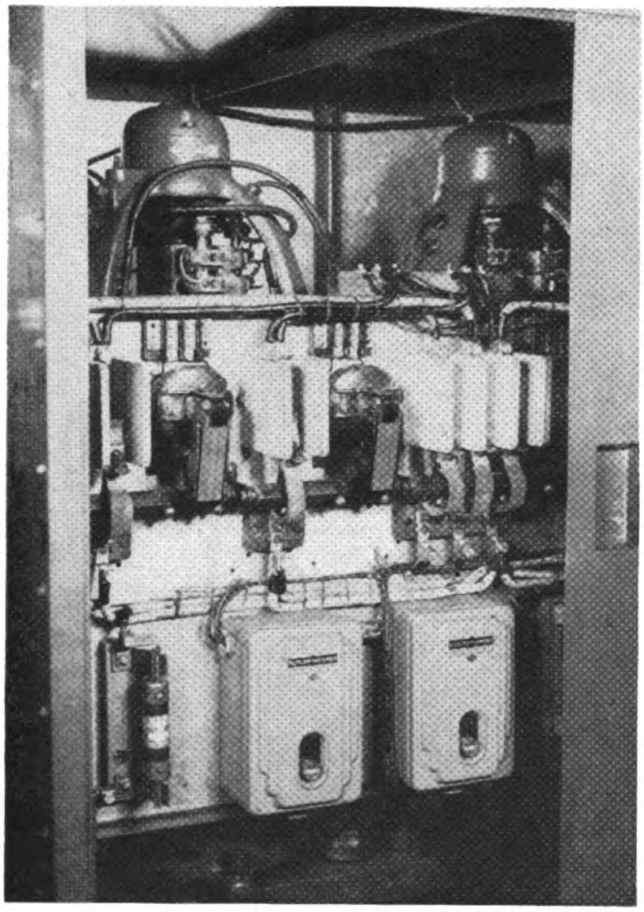
Left: The diesel battery charger in service. Right: The control panel showing meters, starter and circuit breaker pushbuttons, a.c. receptacle (center), two d.c. receptacles and a 110-volt a.c. outlet with cord connected

Charging 112-Volt Diesel Batteries

New Haven builds its own portable machine which operates on 550 volts and will charge 64- or 112-volt batteries



Wiring diagram for the charger



Interior view of the set showing the m.g. sets, the a.c. starter contactors and the d.c. circuit breakers

TO AVOID the need for starting diesel engines on locomotives with low batteries from a second engine, the New Haven was faced with the need of finding some way to charge 112-volt batteries from 550-volt, 3-phase power. The locomotives in question are serviced at the New Haven's Southampton street enginehouse, and the power available at this point is the 550-volt, 3-phase power supplied by receptacles located at every other stall and used for the operation of portable welders. The locomotives have 112-volt and 64-volt batteries.

There was no charging set on the market which would produce the needed charging voltage or which would operate on 550-volt power. Accordingly, the railroad built its own set from such materials as were available and others it could buy.

The railroad had on hand two Electric Products Company vertical motor-generator sets which have 4½-hp., 550-volt, 60-cycle motors and 64/72-volt, 50/30-amp. shunt-wound generators. These were old machines, and they were reconditioned before they were built into the charging set. They were then mounted on a rubber-tired truck with control equipment, and a housing as shown in the illustration. A.c. power is connected through a single 100-amp. receptacle, mounted at the center on one end under the control panel. There are two d.c. outlet receptacles, one on each side of the a.c. receptacle.

The controls are so arranged as to permit operating the machines separately or in series. Interlocks prevent the use of one machine when the two are in series or the operation of the two machines in parallel. The motors are started with push-button operated a.c. contactors with interlocks.

The generator field resistances have fixed values which produce open circuit separate machine voltages of 84 or 168 with the two machines connected in series. Full load amperes are 55, and the characteristics of the machines reduce this automatically to 14 amp. at full charge.

On the panel are two 0-200 voltmeters and two 0-100 ammeters, one ammeter and one voltmeter for each machine. A.c. circuits are protected with overload trips. The d.c. circuits are protected with 70-amp. fuses.

Also mounted on the truck is a 550/110-volt, 500-watt, single-phase dry type transformer. This is used to operate the controls, to run a ventilating fan and to supply an outlet shown in the lower left-hand corner of the control panel for portable extension lights. The ventilating air duct is closed by a shutter when the charger is not in service. This shutter is opened automatically by the ventilating air when the machine is running.

The charger was designed by and built under the supervision of George H. Tryder, general electrical foreman, New York, New Haven & Hartford, Boston, Mass.

They're Both Locomotives

Great and small, the two vehicles shown in the picture have one thing in common: they're both locomotives, but there the similarity stops. The midget will haul precious metals far beneath the earth's surface, while the larger is one of the new series a.c. electrics designed for high-speed freight service on the Pennsylvania. Here is a comparison of the two locomotives.

	Mining Midget	One unit of A.C. Electric
Weight	1 ½ tons	120 tons
Length	4 ft.	54 ft.
Power	5 hp. supplied by battery	2,500 hp.
Width	3 ft.	10 ft. 6 in.
Height	4 ft.	15 ft.
Track gage	18 or 24 in.	56½ in.
Top speed	4 m.p.h.	65 m.p.h.

DIESEL-ELECTRICS—How to Keep 'Em Rolling

8 Inspection and Tests— Two Anti-Friction Bearings

Armature bearings will talk to you, and they will also talk back at you if you don't treat them right

A Study in Contrasts

Two remarkably different kinds of bearings work side by side in today's traction motors. They are opposites in almost every respect, yet each does a swell job. In all kinds of weather they work together in the tough spot down between the drivers, next to the roadbed.

We've already finished checking the motor suspension bearings and seen how easy they are to get at for inspection and measurement. But think about them again for a minute. They are large, simple sleeve bearings with plenty of running clearance all around. The limits of wear are generous. Yet, with only slight attention, they ride bareback on a stiff, bucking axle over thousands of miles of track.

There are still a lot of railway motors in service that have the same type of sleeve bearing on their armature shafts also. All that has been said about clearances, covers, wicks or packing, and oil supply apply just as well to these.

As locomotives grew in size, more and more power had to be packed into the motor space between drivers. Sleeve bearings were long and took up a lot of valuable space inside the motor. So they had to give way to compact anti-friction (ball and roller) bearings. The suspension bearings, being outside the motor, escaped this fate and are still with us as sleeve bearings, even on today's high-power motors.

The armature roller bearings are compact, sturdy assemblies of precision parts squeezed into the limited space allotted to them in the motor frame. The clearances and tolerances are exacting and small. Like the works inside

This is the eighth of a series of articles on maintenance of diesel-electric equipment. This article is written by J. W. Teker, Locomotive and Car Equipment Department, General Electric Company, Erie, Pa.

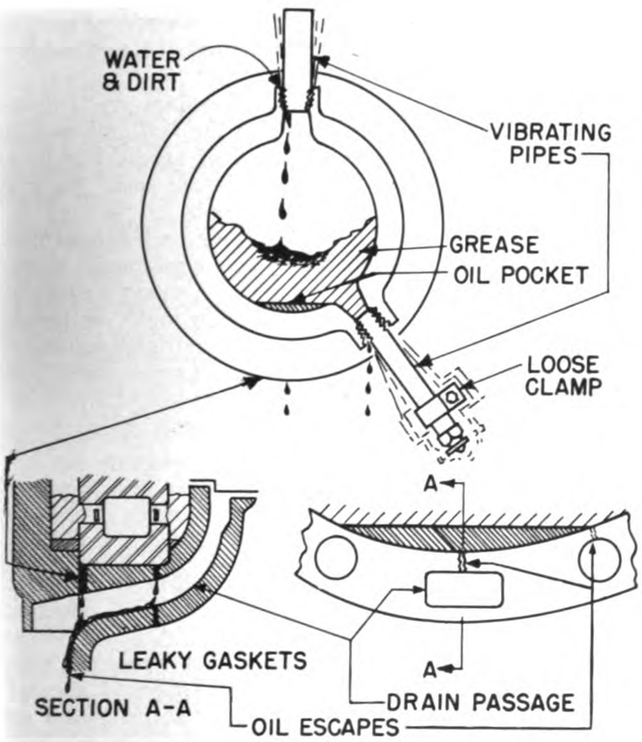


Fig. 1—Tight drain and grease pipes and good gaskets are a "must" on antifriction bearings

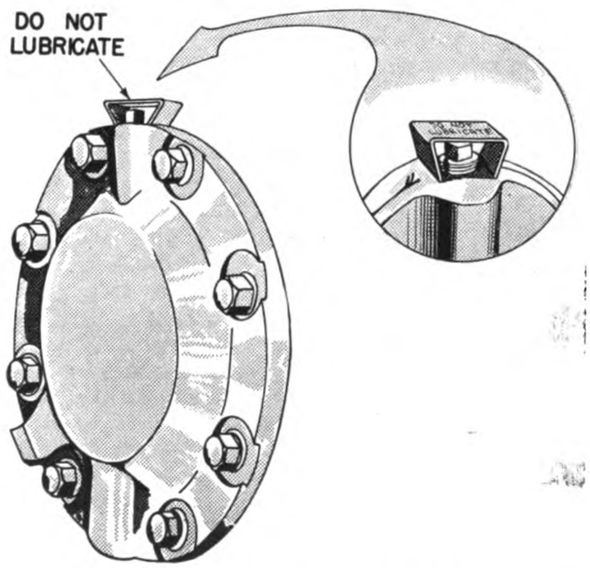


Fig. 2—Method of sealing bearing cap with pipe plug and seal

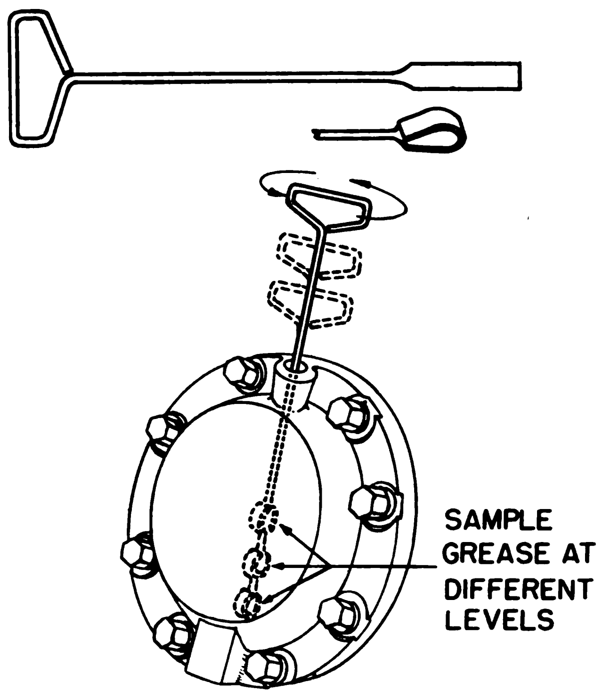


Fig. 3—A probe is a handy way of checking the grease in a bearing without removing the cap

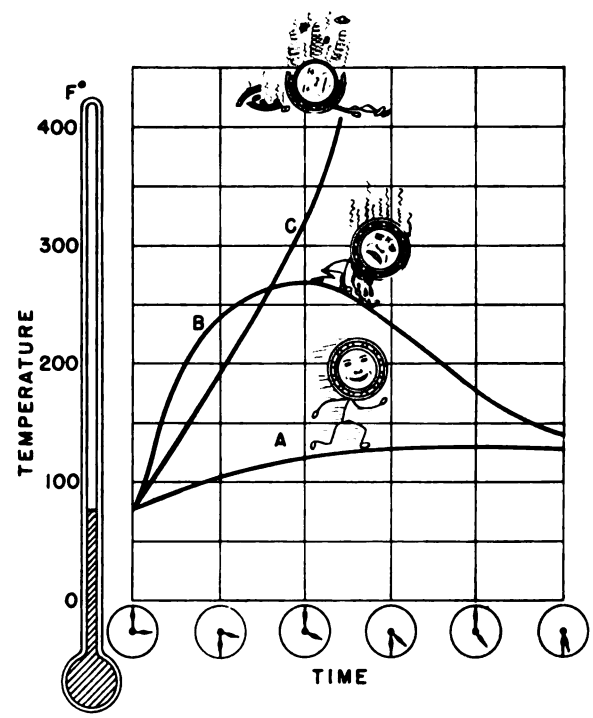


Fig. 4—Effect of greasing on bearing temperature

a watch case, these bearings are completely enclosed and protected. You can't get at them for inspection while the motor is in the truck.

Stop, Look and Listen

All this is rather baffling after dealing with the easy-going suspension bearing. But it's surprising how much you can tell about anti-friction bearings by stopping to look and listen. The welfare of their watch-like parts depends upon the protecting enclosures. Examine these as you would a watch case. Check the bearing caps for dents or bulges which may rub the spinning parts. See that bearing cap bolts are tight so they securely clamp and compress the gaskets. You can't afford to let oil bleed away from the limited lubrication space of these bearings. Defective gaskets, especially at drain or bolt holes, (Fig. 1) will let oil seep out. Examine the ends of bearing cap bolts for oil seepage along the threads. Neither can you afford to let water and dirt enter the bearings. Check lubrication fittings, plugs and pipes to see that they are tight and secure. A poorly clamped lubrication pipe will vibrate and wear the threaded connection. This allows water and dirt to seep in, or lubricant to seep out (Fig. 1). Water and abrasive dirt mixed with grease form a good corrosive lapping compound—just exactly what you don't want in a bearing.

All your care and fine work can go for nothing if the lubrication guns or grease containers are dirty, or if a grease gun is attached to dirty, unwiped fittings. Keep a sharp eye open for good shop housekeeping where bearings are concerned. All this takes just a glance when you know what you are looking for.

Sealed Bearings

After careful research, sealed bearing lubrication was introduced for railway motor armature bearings. Such bearings run the whole time between overhauls without need for lubrication service. The bearing compartments are packed with just the right amount of a carefully selected high-stability grease when the motor is assembled. The grease used must be checked by laboratory methods to be sure it is right. It should be applied fresh to bearings completely cleaned of old grease. This is a job for the service or back shop. The bearing compartments are then sealed shut. Grease fittings are replaced with pipe plugs. These are tack welded to make a man pause and think before removing them. As a further precaution, warning plates reading, "Do Not Lubricate," (Fig. 2), may be welded over these plugs before the motors are placed in service.

Actually, harm may result if such bearings are tampered with between overhauls. Breaking the seal and adding too much grease or the wrong kind of grease has been known to cause bearing failures. This can easily happen to you, so watch the pipe plugs and seals.

Because of the many advantages of sealed bearings, their use has spread rapidly from new equipments to the conversion of existing motive power on many railroads. Now they are used, not only on traction motor armature bearings, but also on the bearings of auxiliary apparatus in the locomotive cab. And why not? Grease pipes and fittings are eliminated. You don't have to keep lubrication schedules for these bearings, so another maintenance chore is scratched from the list.

Still, Keep Your Eye Open

When making your inspection, don't overlook bearing enclosures just because they have sealed-in lubrication. Bolts can still come loose and gaskets can leak. See that the plugs and warning plates are intact. A broken weld on a plug may mean that someone has tampered with the bearing after the back shop boys had checked, greased and sealed it. Perhaps some maintainer, not informed on sealed bearing practice, was determined to do his job. A mere tack weld or seal on a grease plug will not stop such an eager beaver. Out comes the plug and in goes

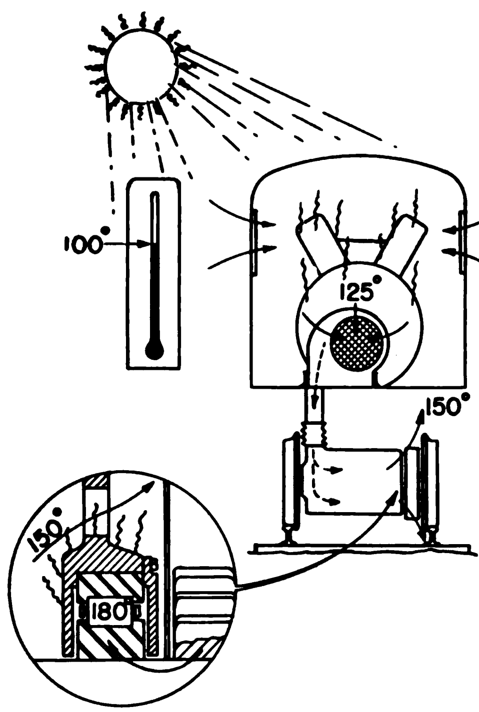


Fig. 5—Why the pinion-end armature bearing operates at high temperatures

the unwanted shot of grease. It's a lucky bearing that has a maintainer alert enough to spot the broken seal or weld. The next thing is to know what to do about it. It's the uncertainty that gets you. What did the other fellow do after he broke the seal? Maybe someone told him to put the plug back and no harm was done. Then again, maybe he added some wrong grease and spoiled the long-duty grease in the bearing.

Try a Little Probing

What to do now? Should the motor be dropped out of the truck and the bearing cap removed for a look inside the suspected bearing? Before you do that, you might probe out a sample of the grease from the bearing compartment. If you intend to do this, be sure to clean up around the loosened plug before you remove it. A probe can easily be made from a piece of soft iron wire. Hammer one end flat and curl it into a loop of such size as to pass through the plug hole (Fig. 3). Push it through the hole into the grease. Give the probe a turn and pull it out. Examine the sample caught in the hollow of the wire loop. Take samples from several levels in the cap. Look for any changes in color or texture between samples that might show that fresh or different grease had been added. If the grease looks uniform, soft and oily you might want to let the bearing run for a few more trips, and check it again later. Remember that a long-duty, high-stability grease changes gradually in service. If, however, it has been spoiled, it will change for the worse much faster. So, if you suspect the bearing has been tampered with, be sure to repeat the test soon.

Suppose the samples probed out show that the grease is already black, stiff and dry. Then there is no choice left but to pull the motor out of service. After that it is a job for the back shop gang to take apart, clean, grease and again seal the bearings. This is a much happier ending than to have a road failure and all that goes with it.

It Pays to Know

Even if you do not operate bearings with sealed lubrication, the method of probing for grease samples is still good. It is an easy way to keep your finger on the plse of your lubrication schedules. Suppose a few random checks show low quantities of dark, stiff, dry grease in the bearing compartments. This would justify removing some bearing caps for a better look. If the condition is general, the lubrication schedule may have to be stepped up. But first be sure that existing schedules are being properly maintained. See that guns deliver the required amount of

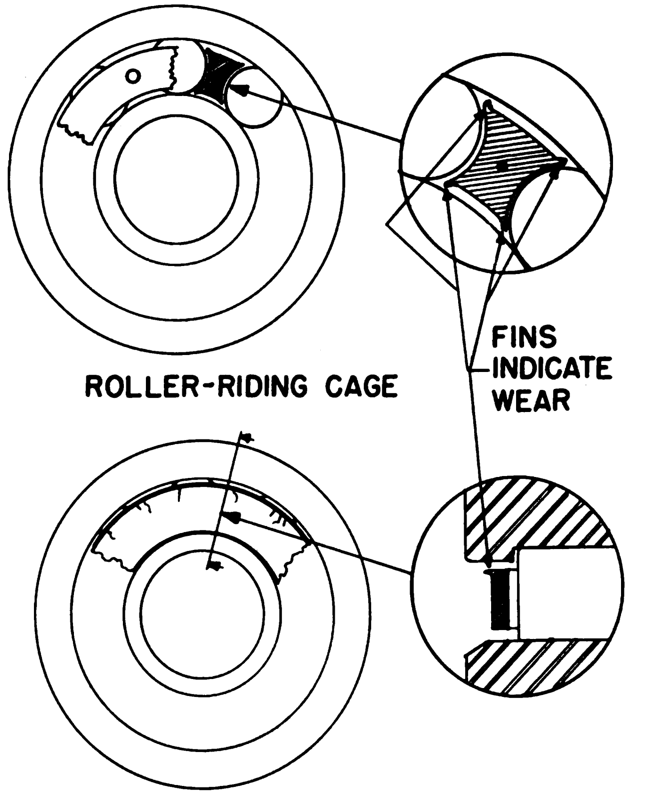


Fig. 6—Effect of Poor lubrication on roller bearings

grease. Don't guess about this—weigh the amount given by each gun. Remember, grease guns are not all alike.

Also, make sure the grease is up to specification. Items such as oil content and penetration (consistency or stiffness) are especially important. Give your laboratory boys a look-in on the job. It might even be a good idea to call on the locomotive builder's service engineers. They may have run into the same kind of problems elsewhere and have some answers.

Then, again, these random checks may show too much grease—or overfilling—so that the bearing housings and drains are plugged full. The overflow of excess grease may work into the motor. This is especially bad if it occurs at the commutator end. Here it may plug air passages or mess up brush contact and insulation. Furthermore, oil spread through the motor may support a damaging fire following a flashover.

Another way to keep track of what's going on is to get reports from the shops where the equipment is overhauled. When motors are torn down, the general condition and quantity of grease can be readily checked.

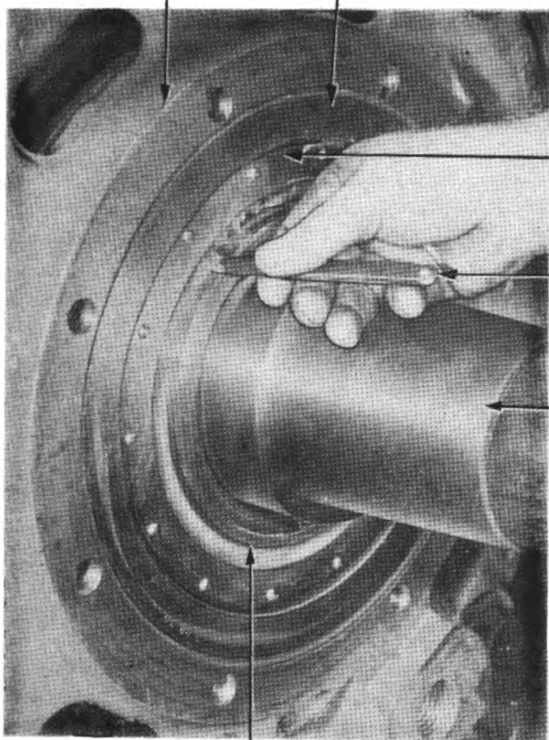


Fig. 7—Use of feelers to check clearance in roller bearing

Then you know the facts and can change lubrication schedules if necessary. You may even be able to track down trouble before it gets to a serious stage.

Such things as operating speed and temperature have much to do with the life of the lubricant. Sustained high speed combined with high temperature breaks down a lubricant faster than usual. High engine room temperatures, faulty blowers and dry gearing all help to raise traction-motor bearing temperatures. Keep these factors in mind when looking for causes of trouble.

Locomotive builders have studied the lubrication problem carefully. Their instructions cover a wide range of general service conditions. Operation in extreme temperatures may require adjustment of the schedule, or even a change in the kind of lubricant used. For instance, extreme cold may freeze regular grease and lock the bearing cage. Then the inner races will skid on the rollers and damage them. But as a rule, builder's recommendations should not be taken lightly. You will be stretching your luck if you jump from one lubricant to another without thorough study and tests. It is something you can't do by guess and by gosh. If there is a big change in your operating conditions, or you want to switch to what you think is a better grease—make tests first. There's always room for improvement in any operation, but be sure of your ground as you go.

What Tests Show

Look at the chart (Fig. 4) which shows results of tests. It will help make this business of bearing lubrication clearer. In curve *A*, you see how a properly lubricated bearing acts when running at full speed. The temperature gradually rises. Heat flows from the warmer bearing to the cooler air around it just as water flows from a higher to a lower level. After some 80 minutes, the bearing temperature levels off at about 30 deg. F. above the surrounding air. Now heat is flowing to the air as fast as it is being generated in the bearing.

From this example, you can see the connection between things as far apart as engine room temperature and traction motor bearing temperature. For instance, take a hot summer day with the outside air at 100 deg. F. Because of the heat given off by the power plant, steam generator, etc., the engine room temperature could easily reach 125 deg. F. (Fig. 5). This air is then blown through the traction motor to cool its working parts. Here it will pick up something like another 25 deg., so it is at 150 deg. F. when it blows over the pinion end bearing. This bearing must climb about 30 deg. higher to get rid of its own heat. Hence, it operates at 180 deg. F.—almost as hot as scalding water. No wonder we are tempted by high-temperature lubricants.

But wait—there is another angle to the problem. See what happens when too much grease is pumped into a bearing. Instead of a nice easy rise, the bearing temperature skyrockets (curves *B* and *C*, Fig. 4). Inside of *half an hour, it has shot away above the hottest day* operating mark, and is headed for the roof. If the grease used melts at this point, the excess will squirt through the running clearance of the bearing seals. This will ease the grease pressure in the bearing and the temperature will drop to about normal (curve *B*, Fig. 4). Of course, such an experience doesn't do the grease any good. In fact, its life has been shortened. But the danger of bearing failure has been averted. Need anything more be said about the importance of keeping a schedule and knowing how much grease is added?

Now suppose the grease used is such that it doesn't melt at this high temperature. The excess cannot escape to relieve the pressure. As a result, the temperature keeps going up (curve *C*, Fig. 4) until the bearing fails. Such a grease has been known to wreck a bearing without harming itself. Since there is always the possibility of over-greasing, it is best to avoid high-temperature greases which have a high melting point.

The use of oil for lubrication gets away from some of the troubles encountered with grease. But the space in a traction motor for carrying oil is very limited and oil escapes quickly if even a small leak gives it half a chance. Gaskets, bolts and plugs must be oiltight, or the oil will be gone before you finish a trip. Also, it is churned and used up during operation, so the bearing must be regularly refilled, and any overflow carefully cleaned up.

Performance Is the Real Test

After all is said and done, the proof of a lubricant is in its performance under operating conditions. Even after the tests just described, you will want to check the lubricant in actual service. The problem is to reduce the risk of failure while you are doing this. One way is to put out several motors with the lubricant on a test basis. Remove grease fittings and put plugs in their place. Seal these with metal tags reading, "Test—Do Not Lubricate." Notify all service points about these motors. This reduces the chances of someone upsetting the test. Keep track of the mileage, lubrication schedule, and exact amount added to each bearing—unless it is a sealed bearing scheme. It's a good idea to make one person responsible for this record.

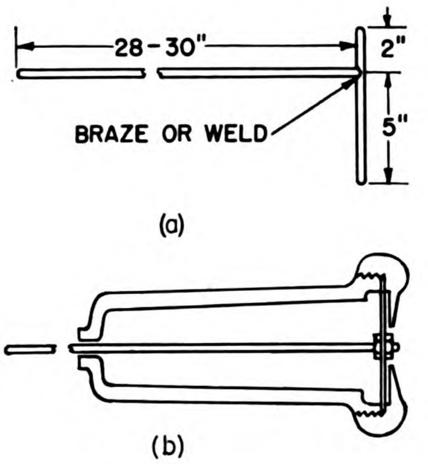


Fig. 8—Two types of listening rods that are easy to make

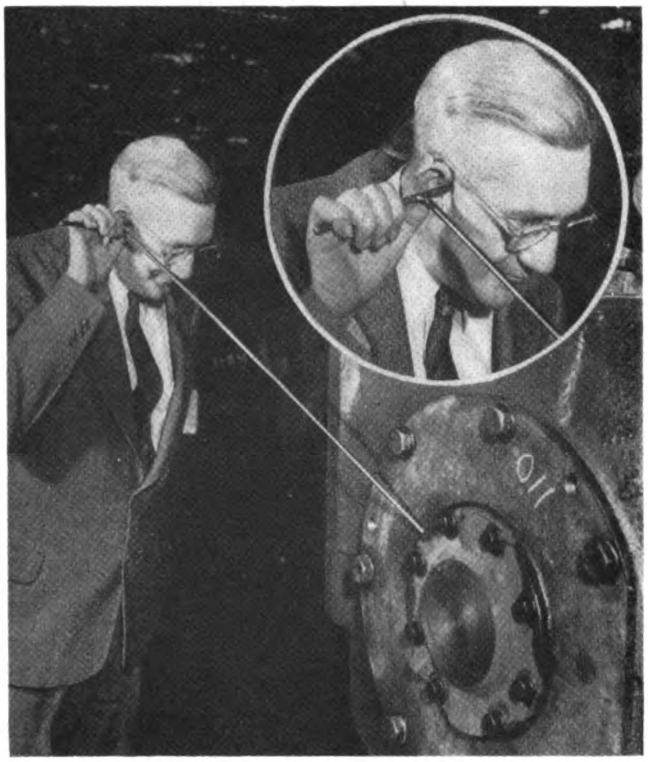


Fig. 9—Correct method of using listening rod on traction-motor bearing

Arrange to remove one motor at a time from service for a check-up. This may be at or between wheel change-outs. Remove the bearing caps to check the amount of grease in each bearing. The commutator-end bearing may behave quite differently from the pinion-end bearing. Don't take chances, look at both. Check the quantity of grease to tell if you must add more or less at each lubrication. Also, see how well the grease is lubricating the bearing. The races and rollers should be oily. If not, they may smear. This occurs when dry roller edges rub the flange of the bearing race like a tire rubs against a curb. The roller cage, or retainer, is usually the first to show wear if lubrication is scant. Look for dragged out feather edges on the roller pockets of a roller-riding cage (Fig. 6). A land-riding cage will show mushrooming and cracks along its outer circumference (Fig. 6). See if there are any signs of overheating and worn particles of cage material present in the bearing. While the bearing cap is off, measure the space between the unloaded rollers and race at the top of the bearing with feelers (Fig. 7). Check this clearance against recommendations. Remember, railway type bearings have clearance when assembled. This is needed to take care of expansion with temperature differences between the inner and outer parts. Sometimes, when bearings are enclosed, attempts are made to find the clearance by lifting the shaft and measuring the movement with an indicator. This is hard to do; but if you try it, be careful not to lunge on the shaft, or you may disturb the indicator enough to give a false reading. Lift the shaft slowly with a jack. If anything serious is found on one bearing, take action on the other test motors right away.

Above all, be careful to keep dirt out of the open bearing assembly when making the inspection. Remember, the bearing is like an open watch. Clean the entire end of the motor before you take off the bearing cap. When you remove it, be sure you are out of the wind so that dirt doesn't blow or fall in. When you close up the job for return to service, see that gaskets and lock-washers are fit for use. You don't want that little puddle of oil that collects in the bottom of the bearing compartment to ooze away. If it does, it may bleed the grease dry. When the next inspection comes up look at another motor, and so on. Continue the test until you are sure of the results.

While this test is easy enough to run, it does take a long while before you know whether the change is safe for your entire fleet. With somewhat more risk, the changeover could be started after the first or second inspection showed all to be well with the test motors. The test should go on, however, with regular checks, for the full time. Then, if trouble does develop, you have some lead time to head it off before it affects the fleet.

Make the Most Of Your Opportunities

Whenever a motor is out of a truck, you have an opportunity to listen to the bearings. Don't pass it up. Bearing failures in service have been averted by taking just a little time to listen to them run before the motor was trucked. Then you can hear the smooth whirr of a healthy bearing, or the grinding crunch or click which spells trouble. Let the motor go through its speed range while you listen.

A regular doctor's stethescope, or one of the electronic devices now available will aid your hearing. But it is surprising how well you can hear these sounds with a simple listening rod (Fig. 8 a). Hold it against the bearing cap, with the other end just a little ahead of the ear on the soft part over the passage to the ear drum (Fig. 9). Experiment until you find what suits you best. Another convenient listening device can be made from an old telephone receiver (Fig. 8 b). Attach the end of a light rod to the diaphragm. Let the other end project through the shell far enough to easily reach the motor.

Now you are ready to practice listening for noisy bearings. It takes only a moment after you have become accustomed to it. And that moment may avoid a mess of smashed machinery. This is preventive maintenance at its best. Even though armature bearings are hidden, inaccessible and completely enclosed, they talk. When you know the language, it is amazing how much you can learn if you just stop to look and listen.

Eliminating Wrong-Voltage Hazards

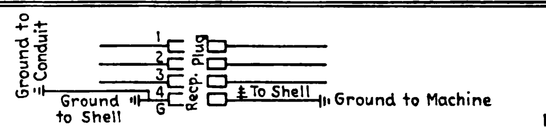
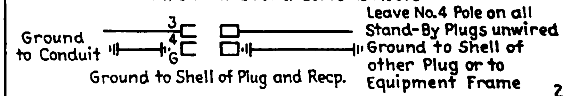
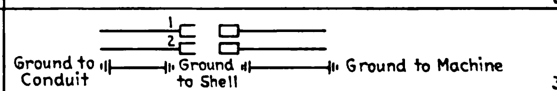
By David H. Noble

Plugging a 110- or 220-volt hand tool into a 440-volt receptacle can have disastrous results, not only to the tool, but to the operator as well. Yet, unless preventive action is taken, it can easily occur even in the best run shop.

The most positive cure is to select a standard, non-interchangeable receptacle for each class of electric service. Sizes and styles of receptacles can be determined by service requirements and voltage. Thus, heavy duty convenience outlets or, preferably, twist-lock receptacles could be standard for 110-volt portable lights, while those for 440-volt service should be capable of carrying the high currents of welding machines and similar apparatus, protected against accidental contact with a "hot" pole. All receptacles should have provision for a grounding conductor from the machine frame, and be properly polarized so that the plug cannot be inserted improperly. High voltage receptacles should be of the circuit breaker type in which an interlocked lid prevents plugging in the portable line until the breaker is placed in the *Off* position.

How one large railroad eliminated the hazards and problems of widely assorted receptacles is shown by the list of standard receptacles in the illustration. In order to permit a gradual change-over, instructions were issued that whenever extensive rewiring was required in a certain shop or area, the new standard receptacles were to be installed. In turn, old receptacles removed from these areas were to be used as replacements for effective receptacles in locations where the new standards were not yet installed. All electrical supervisors and shop storekeepers were furnished copies of the "Standard Shop Receptacles" drawings indicating type receptacles for each service, proper wiring, and ordering information. As a result, it was possible gradually to replace old receptacles in one area at a time without disrupting shop operations.

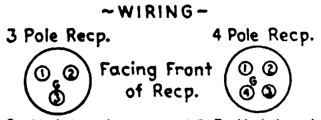
STANDARD SHOP RECEPTACLES AND PLUGS

VOLTAGE	PHASE	RECEPTACLE	PLUG	WIRING	
440 V.-A.C. Welding	3	Pyle National Circuit Breaker Pylet with Interlocked 60-Amp, 3 Wire, 4-Pole Quel-Arc Receptacle Circuit Bkr. to Suit Normal: Style CKJ-Hazardous Locations. VKJ	P.N. "JPD" Quel-Arc Plug 4-Pole, 60 Amp.	 Ground to Conduit; Recp.; Plug; To Shell; Ground to Shell; Ground to Machine	1
220 V.-A.C.	3	Pyle National AAR Std. Stand-By Recp.-3 Wire, 4-Pole, 100 Amp.	Pyle National AAR Std. Stand-By Plug. 3-Wire-4-Pole	Wire other 2 Power Leads as Above  Ground to Conduit; Ground to Shell of Plug and Recp.; Leave No.4 Pole on all Stand-By Plugs unwired; Ground to Shell of other Plug or to Equipment Frame	2
220 V.-A.C.	1	Crouse-Hinds RQH 302-2 Pole Recp.	Crouse Hinds RQ 302 Plug	 Ground to Conduit; Ground to Shell; Ground to Machine	3
110 V.-A.C.	3	Pyle National "CR-" 3-Wire, 4-Pol. Recp.-Style "J"-Spring Cover	Pyle National "SP" 3-Wire 4-Pole Plug-Style "J"	Wire as shown in Line 1	4
110 V.-A.C.	1	Pyle National "CR-" 2 Wire, 3-Pole Recp.-Style "J"	Pyle National "SP" 2-Wire 3-Pole Plug-Style "J"	Ground as shown in Line 1-Wiring same except only 2 Power Leads	5
220 V.-D.C.		Crouse Hinds QE 6303 3-Pole Recp.	Crouse Hinds BP 533 3-Pole Plug	Ground as shown in Line 1	6
110 V.-D.C.		Crouse Hinds QE 6302 2-Pole Recp.	Crouse Hinds BP 532 2-Pole Plug	Ground as shown in Line 3	7
32 V.-D.C. Battery Charging		Pyle National AAR 150-Amp. Battery Charging Recp.	Pyle National BCPD Type Plug	Center Pole-Neg. Term. Outer Pole-Pos. Term.	8

~NOTES~

1. All Recp. to be grounded as shown.
2. Ground Wire must be securely fastened to Plug Shell and when available, the extra Ground Pole, except with 3 Φ, 220 V (Stand-By) Plugs where the No. 4 Pole is to be left unwired.

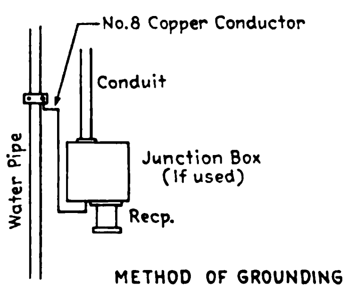
~WIRING~



1 & 2-Hot Leads
3-Ground

1,2,3-Hot Leads
4-Ground

When grounded Neutral System is used the Neutral will be treated as a 'Hot' Lead and will not be connected to the Ground Pole.

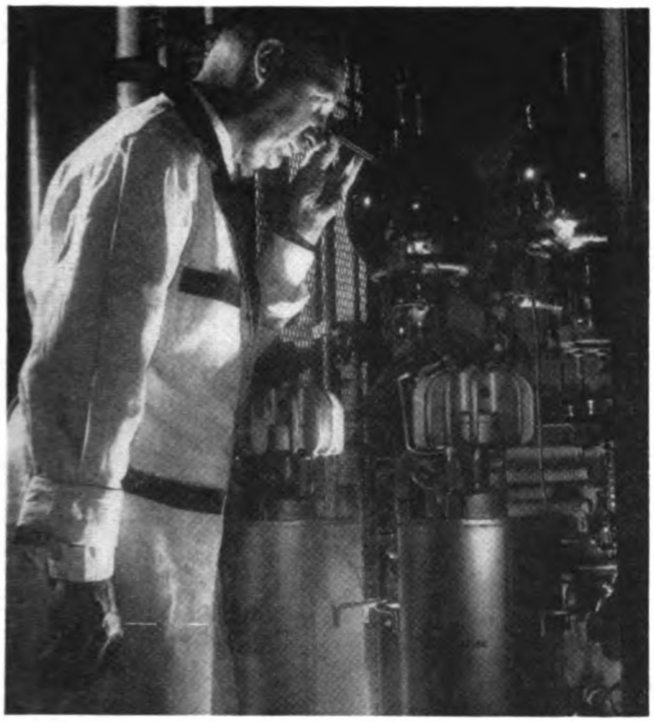


METHOD OF GROUNDING

If no Water Pipe is available use ¾ In. Rod driven 8 Ft. or more into Ground. See Sect. 2582-2586 of Nat. Elec. Code.

~REVISIONS~

A-35-Amp. P.N. Welding Recp. Replaced with 40-Amp.	10-31-50
B-General Revision	12-1-50
C-Wiring Detail Added	3-29-51

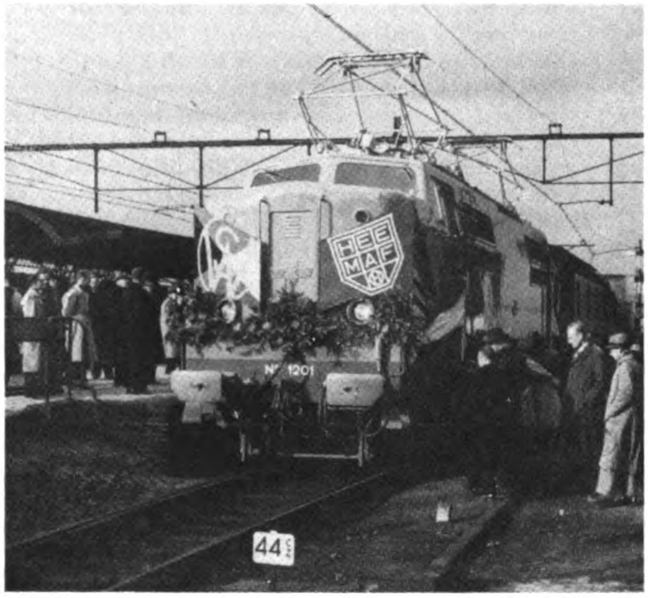


Original Ignitrons which have been in continuous service since 1936 were rated 25 amp.

Evolution of the Ignitron

Ever since the Ignitron mercury-arc rectifier principle was announced by Westinghouse in 1932, engineers have worked to make the Ignitron tube more efficient and reliable. Working with ignitors for the tube, Adolph Toepfer put some of the early Ignitrons on test in 1936 (left) to find out how long they would last. Fifteen years later, during which time the tubes have struck new arcs some 27 by 10^9 times and run up a power bill of over $4,000, the Ignitrons are still converting a.c. to d.c. With reduced anode voltage, and because some carbon has sputtered off the graphite anodes and darkened the glass envelopes, the tubes do not burn as brightly (right). Boron-carbide ignitors are still used in the latest Ignitrons, but a method has been devised of molding boron-carbide powder in a graphite mold, whereas the original ignitors were made by heating carbon to 2,000 deg. F. and converting boron-oxide to boron-carbide. The early Ignitrons pictured were rated 25 amp.; the new type WL-688 Ignitrons shown are rated 400 amp.

Recently developed Ignitrons using improved ignitors operate at a current density of 400 amp.



First of 25 electric locomotives being built at Dutch plants from American design shown at inaugural ceremonies at Hengelo, Netherlands, where the electrical installation was built. The units are scheduled for service on the Netherlands Railways to speed delivery of coal from the mines of Limburg to the industries of the west

U. S. Electric Locomotives In Holland

A fleet of 25 units of a new series of electric locomotives, which are the product of combined American and Dutch engineering skills, is being built by two Dutch companies, to American designs and with more than $1 million worth of American parts. Purchase of the parts was financied with the aid of the Economic Cooperation Administration (now the Mutual Security Agency) under the Marshall Plan.

The design of the electrical installation was provided by the Westinghouse Electric Corporation of Pittsburgh, Pa., while the mechanical design originated with the Baldwin Locomotive Works in Philadelphia, Pa. The new units have begun to move, at the rate of about three a month, from the assembly plants of the two Dutch firms, N. V. "Heemaf-Hengelo", in Hengelo, and Werkspoor, in Zuilen, into the Netherlands Railways system. The entire 25-unit fleet is expected to be on the rails by the end of July.

CONSULTING DEPARTMENT

Should A Ringer Contradict a Megger

We got a "Megger" instrument reading on a locomotive of 30,000,000 ohms (30 meg.) with a 500-volt d.c. Megger. Then when we tried to hi-pot it, the circuit breaker kicked out at about 450 volts (across the hi-pot leads). With this same high megger reading on the locomotive, we tried an old bell ringer and the bell was quite loud. We measured the output of the bell ringer with a 1000-ohm per-volt voltmeter, and the voltage across the leads was only 100. Why would bell ringer ring so loudly when the resistance reading is so high? Is it true then that no matter how high the resistance is to ground, one is not sure the equipment will stand a high-potential test? This happened to us three different times on different locomotives. One time with a "Megger" instrument reading of 30, another of 20, and the third one of 15.

Hi-pot Breakdown May Make Path for Ringer

From the wording of the question, we understand that the sequence of events were:

1. The locomotive was meggered with a 500-volt Megger instrument indicated 30 meg.
2. The locomotive was then given a hi-potential test with a.c. hi-pot equipment and broke down at 450 volts.
3. After the breakdown the ground could be checked with a bell ringing set. There is no intimation in the question that the circuit was checked with the Megger after it broke down on hi-pot.

If this understanding of the sequence of events is correct, we can report having had similar experiences in that a locomotive which has been meggered may break down on hi-pot. The converse is also true that a locomotive may show a low insulation reading, but can pass the hi-potential test without difficulty.

I believe there is a satisfactory answer in the fact that higher voltage was applied to the locomotive by hi-potential test. The Megger instrument manufacturer's instruction book shows that with a 500-volt Megger measuring a 30 meg. resistance, the output of the Megger would be almost its full rated 500 volts, or about 495 volts d.c. The voltmeter used with an a.c. hi-potential testing equipment reads the effective value of the sine wave of voltage. In order to obtain the peak voltage of the sine wave, this effective value must be multiplied by the square root of 2, or 1.41. Therefore, when 450 volts a.c. was applied to the equipment, the peak voltage of this wave was 637 volts, which is materially higher than the Megger voltage. Our assumption would be that this higher voltage caused a breakdown across some small gap or series of gaps. The follow-up current from the hi-pot set then carbonized a solid conducting path resulting in low resistance to ground.

If the above assumptions are correct, it may be assumed that the Megger was giving a true indication. The hi-pot test by actually applying a higher voltage broke something down, and changed the circuit from high resistance to low resistance to ground. The bell ringer was then able to operate on this low resistance.

J. D. Alrich
General Electric Company
Erie, Pa.

Capacitance May Cause Ringer to Operate

The background information given to support the questions is not complete, so certain assumptions will have to be made in our answer.

The first question involves the use of a so-called bell ringer to check the 30-megohm resistance measurement. We think this means that an old-fashioned hand-cranked magneto was used having an a.c. output. This being so, the bell would undoubtedly ring as a result of the capacitance involved in the circuit, regardless of the amount of d.c. resistance in parallel with the capacitance. In other words, depending upon the amount of capacitance involved, and the magneto output frequency and voltage resulting from cranking speed, the results are not at all surprising.

The fact that this circuit broke down at a relatively low voltage after indicating a resistance of 30 megohms is more difficult to explain, and we cannot help but question the information given. We know, of course, that high insulation resistance does not in itself guarantee that a dielectric can withstand an over-voltage, since a clean gap or puncture can be in parallel with the resistance which can flash over through the gas (air) involved. However, to do this the voltage must be somewhat higher than that produced by the "Megger" instrument. At 30 megohms, the regulation of any "Megger" instrument is good, which means that very close to 500 volts d.c. was applied during the test. It is safe to say that the high-potential test equipment used in this case was of the a.c. type, which means that if the voltmeter with which the 450 volts was measured was of the moving-iron type, it measured the r.m.s. value of the voltage and not its peak. The peak value of 450 volts r.m.s. is about 655 volts. Furthermore, when applying an a.c. high-potential test, the test connections should be made in such a manner that no arcing results with consequent high-voltage transients or oscillations. The actual time duration of the application of the a.c. high-potential test is also a factor which must be considered when comparing the relative breakdown strength of insulating materials or gaps.

R. M. Springer

EDITORIALS

Where Do We Go From Here?

Steam locomotives for a hundred years and then diesels. Diesels at first slowly, and then rapidly pushing steam off the reservation. And how long will it take before there are no more steam locomotives—well, practically none? Some look forward to complete dieselization by 1960, and some think it will take five years longer. Few seem to doubt the ultimate outcome.

But there are a few never-say-dies who challenge the diesel aggressor. Among these are those who are working on the gas-turbine-electric locomotive. Much development work has been done; the Union Pacific has put an experimental locomotive through its paces, and now is putting improved types into regular revenue service. Speaking at a meeting of the New York Railroad Club on March 20, 1952, W. A. Brecht, Manager, Transportation Engineering Department, Westinghouse Electric Corporation, told of the operation of the Westinghouse experimental locomotive. It has, he said, been making daily round trips on the Pennsylvania between Harrisburg, Pa., and Altoona, Pa., for a month without a single detention. It has been hauling 29-car trains in express service, burning Bunker C oil.

Many say it would have been nice if the gas-turbine could have been developed sooner to give the diesel more competition. But that is just wishful thinking. By the same token, it would have been nice if we could have had diesels in the 1830's when the steam locomotive was being developed. Even though we have diesel saturation, the gas-turbine can still become a strong competitor. Perhaps, too, the gas-turbine can be taught to burn coal.

Then there is the steam-electric locomotive with high-pressure, 600-lb. per sq. in. boiler which will probably be delivered to the Norfolk & Western about the end of this year. Mr. Brecht stated that this unit, which burns coal, will have a thermal efficiency about double that of the conventional steam reciprocating locomotive.

Always for the diesel there is the specter of straight electrification. Ideal insofar as operation of trains is concerned, but constrained now in this country by high first costs which require long periods of years for amortization. The diesel may be purchased on a pay-as-you-go basis, and with present fuel-oil costs to help the diesel, and insufficient traffic density to warrant the first cost of electrification, the only present market for electric locomotives is on those roads with existing electrified lines. However, should the price of oil increase considerably, electrification might become more attractive, and the manufacturers are ready with new types of electric locomotives to help it along. Mr. Brecht referred to performance of one of these on the Pennsylvania. It, the rectifier locomotive, rated 6,000 hp. hauled a train of 162 loaded coal cars—almost a mile and a quarter long—from Enola Yards, near Harrisburg, Pa., to Morrisville, Pa., at an average speed of 30 m.p.h. over the 130-mile route. This is more than 400,000 gross ton miles per train hour.

Always the research and development departments of our supply companies are breaking their necks to produce new things, and by so doing put their own production departments out of business. Then the production men have to change their dies, their methods, the materials they use, etc. But, under our system of free enterprise, the whole company would go out of business if this were not so. Other companies would produce better equipment and get the business. Anyone who thinks our railway supply industry isn't on its toes should take another look.

Freight Car Conditions in Interchange

An analysis of freight-car conditions prevalent at the great Chicago gateway during 1951, as reported by the Chicago Car Interchange Bureau, affords reasons for encouragement at progress being made and at the same time points unerringly to elements of weakness. As a matter of fact, out of a total of ten statistical tabulations reflecting car conditions and handling in interchange during 1951, as compared with 1950, only four showed improvement to six which indicated poorer performance.

On the credit side of the ledger, first mention should be made of the reduction in cars shopped for old defects. With a total of 4,267,626 cars interchanged at Chicago in 1951, or 118,303 more than in 1950, only one loaded car in each 177 delivered had to be shopped by the receiving carrier for repairs, compared with 1 in 165 cars delivered in 1950. The adjustment of loads in closed box cars dropped from 186 to 94.

Loaded hopper and gondola cars interchanged with partly open doors were reduced from 212 to 162 and the estimated tons of lading lost, from 2,083 to 1,880. Cars with perishable freight loads, shopped for repairs but reaching destination as intended, included 2,084 of the 2,155 cars repaired. Or, put in another way, only one of each 6,060 perishable loads delivered in 1951 failed to reach destination on schedule, as compared with 1 in 111 cars in 1930 when the campaign to cut perishable load delays was first started.

As always, further intensive work is in order and in fact essential to minimize the transfer of loads in interchange freight cars. At Chicago, for example, the number of cars transferred, increased from 1 in 17,808 cars in 1950 to 1 in 13,463 cars in 1951, thus reflecting the failure of originating carriers to exercise sufficient care in furnishing cars mechanically fit to carry loads to destina-

tion. The resultant increased operating expense and cost of load transfers are both charges against railroads on which these loads originate.

Some of the other conditions especially in need of improvement are suggested by the following figures: Cars interchanged at Chicago and found not loaded in accordance with A.A.R. rules increased from 190 in 1950 to 412 in 1951; cars with shifted loads, from 11,073 to 11,720; bad order and unclean cars, from 1,390 to 1,616; empty hopper and gondola cars with improperly secured drop doors, from 3,382 to 4,802; pairs of wheels changed on account of cut journals, from 9,513 to 12,716.

Plainly, there is plenty of work still urgently in need of being done to improve railway freight car conditions and use. An adequate supply of new cars to replace the worst of the present inventory would be a great help.

Working Instruction

Just about everyone will agree that a mechanic being trained for diesel locomotive work will learn more about handling maintenance if along with the explanation of the parts and their functions he is given opportunity actually to perform the maintenance operations himself. This working instruction, or participating instruction, coupled with lectures and discussions is superior in educational value to the lectures and discussions alone for two principal reasons.

When more senses can be brought into play in the learning process, more can be learned and a greater portion of what is learned is retained. Participating instruction further affords the student diesel mechanic a chance to find out what he missed in the more formal phases of the instruction. It is not uncommon for a man to think that he can handle a job after being shown or told how to do it; yet when he is on his own to do the work he finds that he gets stuck somewhere in the procedure. When participating instruction follows classroom instruction the student can have his troubles straightened out on the spot.

The value of affording participating instructions is recognized in recently built diesel instruction cars in two different ways. One is apparent, the other not so apparent. Some cars have engine sections and provisions for dismantling and assembling the engine and the individual engine parts. On others the space and money available have been devoted to studying operating features and the causes of failures for greater emphasis on trouble shooting. Railroads that follow the latter practice feel that where participating instruction is desirable it can be given more effectively on an actual locomotive.

Time and experience will show which procedure is best under what circumstances. A major factor is whether the car will be used to teach men before the locomotives arrive on a newly dieselized division, or whether the car will follow the arrival of the locomotives; only in the latter event will the locomotives be available for participating instruction. The phase of diesel instruction to be emphasized, trouble shooting or maintenance, should play an important role in laying out any new instruction car. So too should be the method of giving participating instruction if this valuable tool in teaching diesel maintenance and operation is to achieve maximum effectiveness.

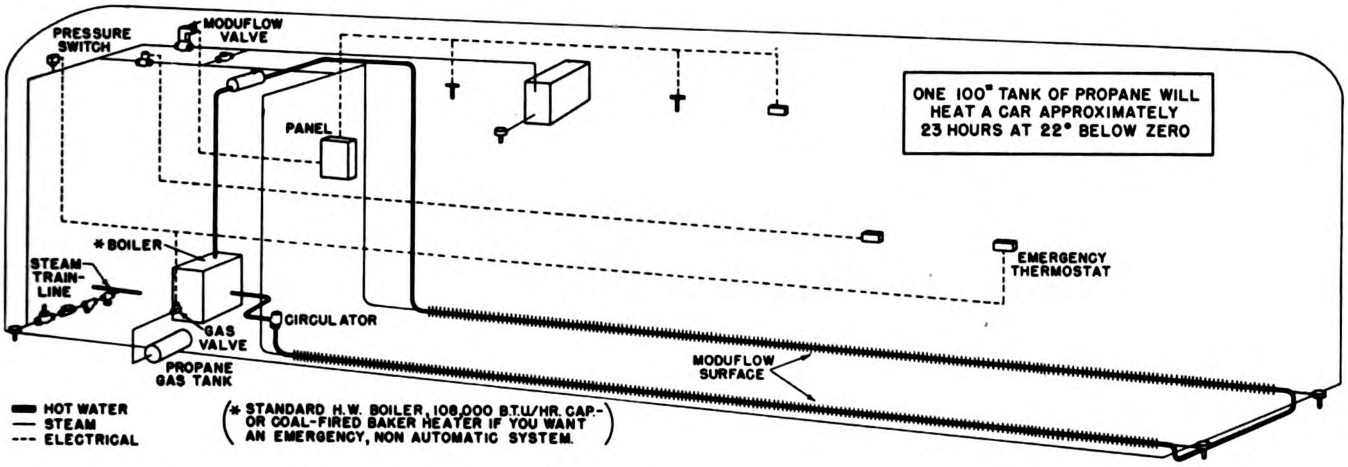
New Books

ENGINEERS' ILLUSTRATED THESAURUS. *By Herbert Herkimer. Published by the Chemical Publishing Company, 212 Fifth avenue, New York 10. 572 pages, 5½ in. by 8 in. Price, $6.*

The purpose of this book is to emphasize the underlying principles of machine elements and assembled machinery, not structural details such as would appear in a textbook of machine design. Machine parts and their movement are classified in a manner similar to that of Roget's Thesaurus of English Words and Phrases in which a word is classed according to the idea it intends to convey. Each class is divided into sections, and each section is further subdivided into topics, illustrated by drawings or photographs. Descriptive text is kept to a minimum. an explanation of the method by which an element accomplishes its particular function being given only where necessary. Illustrations, totaling over 8,000, include assembly drawings typical of American and foreign designs. Among the principal classes treated in the book are fasteners; adjusting devices; supports and structures; basic mechanical movements; combustion; prime movers: transportation; electrical appliances; comfort heating, cooling and air conditioning, etc.

MAKING, SHAPING AND TREATING OF STEEL. *Sixth Edition. Published by the United States Steel Company, 525 William Penn Place, Pittsburgh 30. 1,435 pages, illustrated. Price, $7.50; to schools and colleges, $5.*

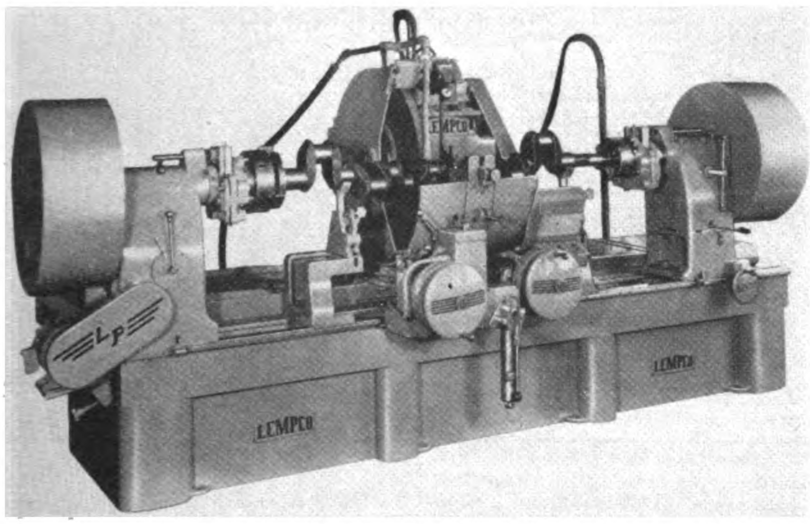
This edition is a complete revision based on the original text by J. M. Camp and C. B. Francis. The information contained in its 38 chapters is a compilation of past and present practices in the iron and steel industry based upon the practical experience of the many experts and authorities in each steel-making field who cooperated in the preparation of the book. Each chapter is made as nearly independent of the others as possible and is subdivided into sections. The chapter on the principles of heat treatment of steel includes the work of Bain, Davenport, Grossmann and others who have helped to reduce the art of heat treatment to a science, with changes in steel structure predictable by comparatively simple diagrams. Similarly, understanding of thermo-dynamics, heat flow and ceramics has been broadened by Dr. J. B. Austin and his associates at U.S. Steel's Kearny Research Laboratory. Other subjects completely revised and expanded to cover new methods and techniques developed in the past decade include Fundamental Principles of Chemistry and Physics; Refractories; Manufacture of Pig Iron; The Bessemer Process; The Open-Hearth Process; Manufacture of Steel in Electric Furnaces; Steel and Iron Castings; Manufacture of Hot-Strip Mill Products; Manufacture of Cold-Reduced, Flat-Rolled Products; all chapters on various grades of steel; Mechanical testing, etc. The index contains more than 23,000 listings.



Emergency Heat for Passenger Cars

A means for heating passenger cars when the locomotive runs out of water or when batteries fail has been developed by the Minneapolis-Honeywell Regulator Company, Minneapolis, Minn. It may also be used when a car is not in a train, when it is desirable to use a freight locomotive to haul a passenger train or during long periods when the cars have to be switched.

The device used is a modification of the regular Minneapolis-Honeywell heating system. It consists of a propane gasfired hot water boiler, controlled by a valve and thermostat, which get their power requirements from the pilot flame. No steam or electric energy are needed. The closed water loop which normally supplies floor heat is run through the gasfired boiler at one end of the car. A pressure switch starts the boiler automatically whenever the steam pressure on the regular system falls below a pressure of about two pounds. The design of the equipment is such that it may be adapted to cars that are now in service.



Hydraulic Traverse Crankshaft Regrinder

A newly designed type RCG crankshaft regrinder which transfers the burden of accuracy from the operator to the machine has been made available by Lempco Products, Inc., Bedford, Ohio.

The grinding wheel can be slowly power-fed, through hydraulic controls across the bearing surface. In-feed and retraction of grinding wheel is also accomplished hydraulically in ½ second without cranking. Its shaft is balanced within ounces on a direct-reading scale without interfering with swing or stroke.

This unit has capacities up to 137 in. shaft, depending on the model, important on the new and larger shafts used in diesel work. Among its features are a 360 deg. graduated throwhead that enables the operator to move from one set of throws to another in one set up.

Three grinders are available in 89, 125 or 137 in. capacities, with stroke up to 14 in.

◆

Fuel Oil Heater Cleaning Compound

A cleaner for removing carbonaceous deposits from the tubes of fuel oil heaters without dismantling the equipment has been introduced by the Magnus Chemical Co., Garwood, N. J. These deposits are simply exposed to the action of the Chemical compound.

Experience of a power plant for a western railroad indicate the following method has proven successful

An empty 55-gal. drum was equipped with a reversible flow gear-type pump, motor-driven and piped, with a capacity of 3-gal. per min. All valves on the fuel oil lines to the heater were closed and oil in the unit drained. A pipe was connected from the drum to the inlet port of the exchanger. Its outlet port was in turn connected to a return line to the drum, equipped with a screen to retain loosened carbon deposits.

A solution of one part by volume of

(Continued on page 144)

NEWS

More Material Allocated for Equipment

INCREASED allotments of controlled material for second-quarter production of freight cars and locomotives have been announced by the Defense Production Administration.

The increases allocated to the National Production Authority's Railroad Equipment Division material for the production of an additional 3,000 freight cars during the second quarter. Since previous allocations contemplated a second-quarter production of 18,000 cars, the quarter's program has now been put on a 7,000-cars-per month basis.

The D.P.A. announcement also said that car builders had been given permission to build up to 4,000 (instead of 3,000) additional cars, if this can be done "by stretching materials through conservation measures and use of inventory."

As for locomotives, the increased allotments are expected to raise the second quarter's production by 100 engines—from 700 to 800. And the industry will be permitted to build 50 more if it can stretch its allotments that far.

Administrator James K. Knudson has filed with D.P.A. a presentation seeking materials for production in this year's third quarter of 30,000 freight cars (other than tank cars), 2,550 tank cars, 100 passenger-train cars and 975 locomotives.

Since Mr. Knudson's presentation, the N.P.A. has announced that locomotive builders has accepted a "tentative formula," offered by N.P.A., "which would be used to govern unit output and the distribution of controlled materials starting in the third quarter." The formula has been approved by N.P.A.'s Locomotive Builders Industry Advisory Committee, the announcement also said.

It went on to explain that the formula "totals production of diesel-electric locomotives of all sizes in the proposed three-year base period (1948-1950) and permits each builder to produce locomotives according to his percentage of industry's total unit output in that period." At the present time, locomotive builders are allocated materials on the basis of their own individual production in the 1948-50 period.

Taking into account the output of diesels for United States railroads, and for industrial, export and Army use, N.P.A.'s Railroad Equipment Division compiled the following "tentative" table showing production by each builder in the base period, and each builder's proposed percentage of permitted output.

As N.P.A. reported proceeding of a closed meeting held during March of the advisory committee, the group recommended that the Defense Production Administration, in allocating materials, arrange to handle military requirements separately from those for commercial-type locomotives. The committee also recommended that the military orders be given

(Continued on page 118)

TABLE SHOWING TENTATIVE PRODUCTION BY BUILDERS OF DIESEL-ELECTRIC LOCOMOTIVES DURING THREE-YEAR BASE PERIOD (1948-1950)

Builder	Total Production 1948—1949 1950	Percentage
American Locomotive Company	2,228	21.7
Baldwin-Lima-Hamilton Corporation	1,220	11.9
Electro-Motive Division, General Motors Corporation	5,283	51.4
Fairbanks, Morse & Co.	372	3.6
Davenport Besler Corporation	109	1.1
General Electric Company	800	7.8
Plymouth Locomotive Works	5	0.04
Vulcan Iron Works	7	0.06
Whitcomb Locomotive Works	247	2.4

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

Item No.		Month of November 1951	Month of November 1950	11 months ended with November 1951	11 months ended with November 1950
	FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)				
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	22,211	29,011	274,432	317,821
3-06	Total, Diesel-electric	24,804	19,271	248,998	191,774
3-07	Total, electric	793	798	8,935	9,087
3-04	Total, locomotive-miles	47,809	49,089	532,387	518,749
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,699	1,696	19,017	17,924
4-06	Empty, total	917	868	9,722	9,327
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	39,715	48,415	482,835	530,458
6-02	Total in oil-burning steam locomotive trains	10,523	13,424	130,867	141,804
6-03	Total in Diesel-electric locomotive trains	68,652	53,928	696,246	543,808
6-04	Total in electric locomotive trains	2,124	2,158	24,428	24,229
6-06	Total in all trains	121,023	117,964	1,334,513	1,240,605
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.04	1.05	1.04	1.05
10-02	Loaded freight car-miles	39.20	38.40	39.60	38.60
10-03	Empty freight car-miles	21.20	19.70	20.30	20.10
10-04	Total freight car-miles (excluding caboose)	60.40	58.10	59.90	58.70
10-05	Gross ton-miles (excluding locomotive and tender)	2,794	2,673	2,781	2,672
10-06	Net ton-miles	1,310	1,242	1,305	1,223
12	Net ton-miles per loaded car-mile (M-211)	33.40	32.30	32.90	31.70
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	64.90	66.10	66.20	65.80
14	Averages per train hour (M-211):				
14-01	Train miles	17.10	16.70	16.90	16.90
14-02	Gross ton-miles (excluding locomotive and tender)	47,157	43,948	46,499	44,469
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	46.40	46.40	46.20	45.30
14-02	All	44.30	44.00	44.10	42.55
15	Average net ton-miles per freight car-day (000) (M-240)	962	941	961	880
17	Per cent of home cars of total freight cars on the line (M-240)	38.10	37.00	37.20	41.30
	PASSENGER SERVICE (DATA FROM I.C.C. M-213)				
3	Road motive-power miles (000):				
3-05	Steam	8,434	11,310	109,447	128,382
3-06	Diesel-electric	16,965	15,062	180,111	160,774
3-07	Electric	1,589	1,572	17,766	17,605
3-04	Total	26,988	27,945	307,325	306,762
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	265,404	269,256	2,997,852	2,955,677
4-09	Total in coal-burning steam locomotive trains	45,624	61,442	575,003	666,196
4-10	Total in oil-burning steam locomotive trains	28,489	34,474	355,661	403,440
4-11	Total in Diesel-electric locomotive trains	173,783	156,442	1,876,271	1,696,601
12	Total car-miles per train-miles	9.66	9.47	9.59	9.44
	YARD SERVICE (DATA FROM I.C.C. M-215)				
1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	1,064	1,435	13,154	15,664
1-02	Steam, oil-burning	224	279	2,604	2,757
1-03	Diesel-electric[1]	3,084	2,752	32,557	27,591
1-06	Total	4,396	4,494	48,594	46,314
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	37	53	496	634
2-02	Steam, oil-burning	13	15	143	149
2-03	Diesel-electric[1]	245	237	2,665	2,515
2-06	Total	329	339	3,672	3,673
3	Hours per yard locomotive-day:				
3-01	Steam	7.70	8.80	7.80	8.10
3-02	Diesel-electric	17.20	18.10	17.20	17.50
3-05	Serviceable	14.60	14.80	14.40	14.20
3-06	All locomotives (serviceable, unserviceable and stored)	17.70	12.90	12.40	12.00
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.79	1.84	1.77	1.79
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.77	0.78	0.76	0.77

[1] Exclusive B and trailing A units.

more for your money in a GM Diesel Locomotive

ADVANCED manufacturing methods are only part of the story, of course, but they do help to explain the extra values you find in General Motors Diesel locomotives.

Never-ending development of special-purpose machines, tools and techniques has enabled us not only to build these locomotives in large-scale volume, but to produce a constantly improving product as well. And the task is far from finished.

GM production engineers conduct a continuous search for easier and more efficient ways of doing every job — from the production of raw materials straight through the manufacture of all components to the finished locomotive. Because, as everyone knows, the easier you make it to do a job, the better the job you get.

Here you see a few specialized operations — typical of hundreds at Electro-Motive — where the economies of streamlined mass production are utilized to construct locomotives of top quality at the lowest possible cost.

10 PLUS FEATURES IN ELECTRO-MOTIVE'S LIFELONG SERVICE PROGRAM

1. **UNMATCHED EXPERIENCE** gained in designing, engineering and building more than 11,000 Diesel locomotive units.
2. **SUPERIOR MANUFACTURING FACILITIES** for mass-production of highest-quality locomotives at lowest cost.
3. **PROMPT PARTS SUPPLY** through strategically located factory branches and parts depots at eight key railroad centers.
4. **SKILLED TROUBLE-SHOOTING** and maintenance advisory service by a nationwide staff of 150 service engineers and parts specialists.
5. **FACTORY REBUILDING** of major assemblies with same techniques and tooling used in new manufacture.
6. **UNIT EXCHANGE SERVICE**—Prompt delivery of fully rebuilt assemblies in exchange for units needing rebuilding.
7. **PROPER SCHOOLING** of operating and maintenance personnel from the first day General Motors equipment goes on the line.
8. **SPECIAL ENGINEERING** of new and improved parts to make them fit General Motors units of any age.
9. **ONE-YEAR 100,000-MILE GUARANTEE** on Electro-Motive parts and rebuild effective upon installation, *not* the date of shipment.
10. **FACILITIES PLANNING SERVICE** — Expert assistance in helping railroads plan Diesel servicing and parts warehousing facilities.

ENERAL OTORS
LOCO OTIVES

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS

La Grange, Illinois • Home of the Diesel Locomotive

In Canada: GENERAL MOTORS DIESEL, LTD., London, Ont.

preference; but that material for them should be allocated separately, and they should not be in the total over-all scheduling of railroad, industrial and export orders.

The committee was also reported to have urged that locomotive builders be given immediate (second-quarter) authority to make as many locomotives as possible from their allotments of materials, their inventories, and savings through conservation and substitution. Meanwhile, N.P.A. officials stated that they were studying the builders' third-quarter requirements; and the Railroad Equipment Division "is appealing for the programming of 1,212 locomotives in the third quarter as compared to the 850 authorized in the second quarter."

The N.P.A. statement went on to refer to "tentative" third-quarter allocations which would permit the production of only 800 locomotive units.

Railroads Set New High In Efficiency in 1951

American railroads operated with the greatest overall efficiency on record in 1951, according to year-end reports received by the Bureau of Railway Economics of the Association of American Railroads.

Railroads not only moved more freight per train than ever before, but freight was transported at the highest average speed ever attained, the bureau said in a March 18 summary basd on these reports.

Class I roads moved an average of 21,767 net ton-miles per freight-train-hour in 1951, the highest average on record. This was approximately three times as great as the average for 1920 and approximately one-half above that for 1941. The average in 1951 also was an increase of 1,424 net ton-miles above the previous high record established in 1950, the bureau said.

Average speed of freight trains in 1951 also was greater than in any preceding year, amounting to 17 m.p.h. for all freight trains operated by Class I roads. This included the average speed of all freights, including locals as well as through trains, from terminal to terminal, and took into consideration all stops to add or remove cars, service stops and other delays occurring during that time.

This average was an increase of 65 per cent compared with 1920, and an increase of three per cent compared with 1941.

Class I carriers also handled an average of more freight cars per train in 1951 than ever before, the average in the past year having been 59.8 cars, compared with 35.6 cars in 1920 and 50.3 cars in 1941, the bureau continued. The average in 1950 was 58.5 cars per train.

A new high record in average speed of all passenger trains also was reached by Class I railroads in 1951. In that year, the average for all passenger trains between terminals, for both local and through trains, was 37.7 m.p.h., compared with 37.4 miles in 1950 and 36.1 miles in 1941.

ORDERS AND INQUIRIES FOR EQUIPMENT PLACED SINCE THE CLOSING OF THE MARCH ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horse-power*	*Service*	*Builder*
Central of New Jersey	19	1,600	General utility	Alco-G. E.
	13	1,600	General utility	Electro-Motive
	4	1,200	General utility	Baldwin-Lima-Hamilton
	2	1,200	Yard switch	Electro-Motive
Manistique & Lake Superior	1[1]	600	Switcher	Alco-G. E.
New York Central	16A	1,600	..	Alco-G. E.
	8B	1,600		Alco-G. E.
Western Pacific	6	1,200	Switchers	Electro-Motive
	9	1,500	General purpose	Electro-Motive

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Carbon County	200	70-ton hopper	Greenville Steel Car
Chesapeake & Ohio	1,000[2]	70-ton hopper	American Car & Fdry.
Chicago, Milwaukee, St. Paul & Pacific	100[3]	Flat	Company shops
Delaware & Hudson	1[4]	246-ton flat	Company shops
Ft. Dodge, Des Moines & Southern	200	50-ton box	Pullman-Standard
Grand Trunk Western	6	Caboose	Internat'l Ry. Car & Equip.
Great Northern	100	70-ton covered hopper	Pullman-Standard
Minneapolis, St. Paul & Sault Ste. Marie	300	50-ton box	Company shops
	100	50-ton gondola	Company shops
Nashville, Chattanooga & St. Louis	400	50-ton hopper	Pullman-Standard
New York Central	600	70-ton covered hopper	Pullman-Standard
	500	50-ton box	Pullman-Standard
St. Louis-San Francisco	500	50-ton hopper	Pullman-Standard
Union Pacific	500	70-ton ore	Company shops
	600	70-ton gondola	Company shops
	500	50-ton box	Company shops
	500	50-ton auto-box	Company shops
Wabash	20[5]	Caboose	Company shops

PASSENGER-CAR INQUIRIES

Road	*No. of cars*	*Type of car*	*Builder*
New York, New Haven & Hartford	100	Coaches	
	100	Baggage	
	60	Multiple-unit	
Canadian National	47	Coaches	
	58	Bedroom-roomette	
	8	Buffet-lounge	
	6	Drawing-room-sleeping	
	10	Bedroom-dining-room-sleeping	
	5	Parlor-buffet	
	20	Tourist	
	20	Dining	
	15	Cafe-parlor	
	5	Parlor	

[1] Delivery expected in the fall.
[2] Authorization to purchase this equipment at an approximate cost of $6,000,000 was reported in the December issue.
[3] Depending on anticipated material deliveries, the road expects to build two of these skeleton log flat cars daily beginning in mid-April.
[4] Delivery expected in the third quarter of this year. Estimated cost, $36,000.
[5] Final delivery on the group expected this month. Estimated cost, $200,000.

NOTES:

Transportation Corps.—The Transportation Corps has cancelled, because of a major specification change, its call for bids on 135 40-ton refrigerator cars which was announced in the December issue.

Western Pacific.—The Western Pacific intends to place orders for 100 70-ton gondola cars and 100 70-ton ballast cars.

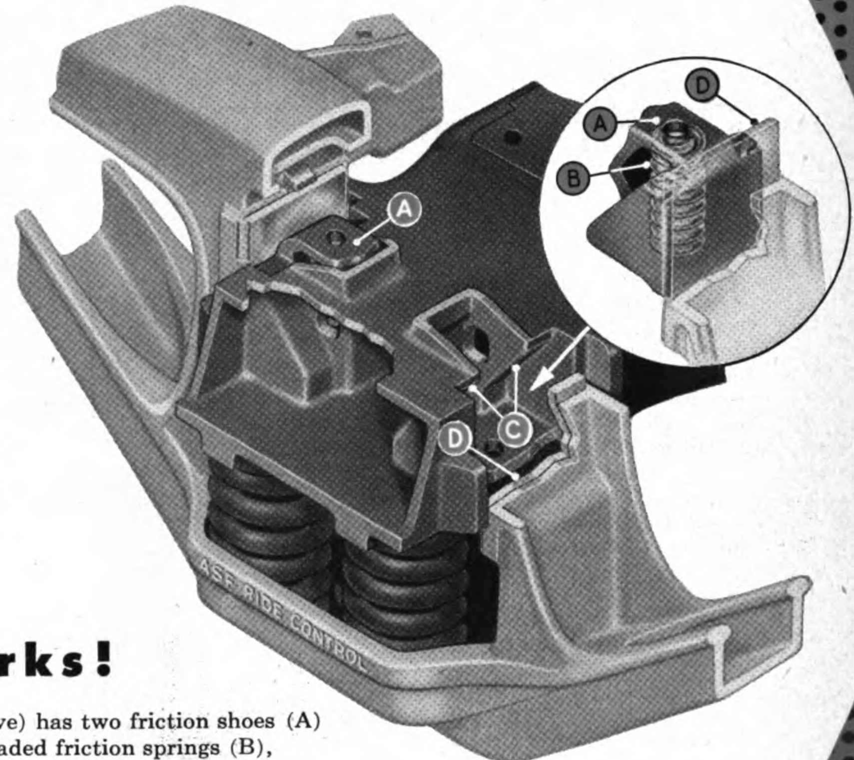
SUMMARY OF MONTHLY HOT BOX REPORTS

Month	Foreign and system freight car mileage (Total)	Cars set off between division terminals account hot boxes: System	Foreign	Total	Miles per hot box car set off between division terminals
July 1950	2,745,932,894	....	.....	23,957	114,619
August 1950	2,937,455,020	7,422	15,490	22,912	128,206
September 1950	2,974,297,739	6,541	12,881	19,422	153,141
October 1950	3,165,997,915	4,343	8,935	13,278	238,439
November 1950	2,868,871,913	2,536	5,331	7,867	364,672
December 1950	2,813,042,212	2,278	5,968	8,246	341,140
January 1951	2,840,847,511	2,870	8,436	11,306	251,269
February 1951	2,425,226,454	4,528	14,063	18,591	130,452
March 1951	3,063,173,942	3,667	10,078	13,745	222,857
April 1951	2,996,562,763	3,702	8,914	12,616	237,521
May 1951	3,013,634,782	5,631	13,737	19,368	155,599
June 1951	2,874,873,495	7,074	15,376	22,450	128,057
July 1951	2,768,920,095	8,886	18,823	27,709	99,929
August 1951	3,009,371,111	9,023	19,092	28,115	107,038
September 1951	2,925,570,545	6,472	13,565	20,037	146,008
October 1951	3,116,490,095	4,131	9,053	13,184	236,348
November 1951	2,939,503,144	2,022	4,405	6,427	457,368

Miscellaneous Publications

Report on the Elevated-Temperature Properties of Stainless Steel (STP No. 124). Published by the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, 120 pages: 8½ in. by 11; bound in heavy paper cover. Price, $4. This 1952 report has been prepared by Ward F. Simmons and Howard C. Cross of the Battelle Memorial Institute and issued under the auspices of the A.E.T.M.-A.S.M.E. Joint Committee on the Effect of Temperature on the Properties of Metals. It is essentially a graphical summary of elevated-temperature data for the commercially produced stainless steels. In-

It wasn't so easy to make it SO SIMPLE!



We believe that ASF Research has made very valuable contributions to the railroad industry. Proof? Well, for one thing, the record of the Ride-Control Truck! This is the truck—designed, developed, tested and *introduced* by ASF—that made possible today's freight train speeds.

It wasn't so easy to design a product which answered so completely the needs of modern railroading, yet operated on such a simple, basic principle that it definitely assured dependable, trouble-free service *and* the lowest possible maintenance costs.

Four little friction shoes and four constant-pressure friction springs did the trick! They made it possible, for the first time, to have the softness of long-travel springs, under *proper control!*

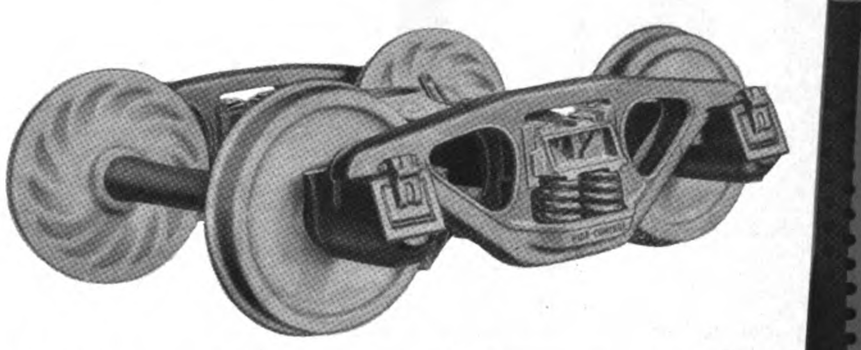
Today the ASF Ride-Control Truck is *the most-copied railroad truck in America!*

How it works!

Each Ride-Control bolster end (see above) has two friction shoes (A) into which are fitted two pre-loaded friction springs (B), both of which are compressed when assembled. Spring forces the shoe upward, along the inclined surface (C), thus outward, *with constant pressure*, against the opposing hardened friction surface (D). That's it!

Ride-Control Trucks are *right* for every type of lading. Investigate them!

ASF



Ride-Control® Truck

AMERICAN STEEL FOUNDRIES

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Mint Mark of ⬡ *Fine Products*

cluded are summary curves for tensile strength, 0.2 per cent offset yield strength, per cent elongation, per cent reduction of area, stresses for rupture in 100, 1,000, 10,000 and 100,000 hr. and stress for creep rates 0.0001 and 0.00001 per cent per hour (1 per cent in 10,000 and 100,000 hr.) The data sheets in the Appendix give the chemical composition, processing data, and other pertinent information from which summary curves and charts were prepared.

TOOL STEEL HANDBOOK. *Allegheny Ludlum Steel Corporation, 2020 Oliver building, Pittsburgh 22, 197 page book, 7¼ in. by 10½ in.* This volume is intended as companion literature to previously published "Stainless Steel Handbook" and "Strength of Stainless-Steel Structure Members as Function of Design." The volume on tool steels begins with charts and tables giving specific and comparative data on properties, analyses and applications. Detailed descriptions of all important grades, alphabetically arranged, follow. Later chapters deal with the many forms and finishes of tool and die steels and such allied products as the sintered carbides marketed under the name of Carmet. The final sections comprise extensive discussions of heat treating and handling techniques as applied to tool and high-speed steels, weight tables, and other reference material.

SUPPLY TRADE NOTES

NATIONAL SEATING COMPANY.—The National Seating Company, of Mansfield, Ohio, recently elected the following officers: President, *Robert G. Brooks;* vice-presidents, *J. E. Bingamon, C. A. Van Derveer, Jr.,* and *Bob Williams;* and secretary-treasurer, *W. A. Gustafson.* All were formerly connected with S. Karpen & Bros., in the sales and management ends of the transportation seating division.

◆

GENERAL MOTORS CORPORATION.—*Nelson C. Dezendorf* has been elected a vice-president of General Motors. Mr. Dezendorf is also general manager of the *Electro-Motive Division,* to which position he was appointed on February 26. *Paul R. Turner,* eastern regional manager, succeeds Mr. Dezendorf as director of sales of the Electro-Motive Division.

Mr. Dezendorf attended the University of Oregon and, after service in the Army

N. C. Dezendorf

during World War I, returned to the University of California to obtain a degree in engineering. He entered the employ of General Motors Acceptance Corporation at Portland, Ore., in May 1922, and became a vice-president of G.M.A.C. in 1931 and a director and member of the Executive Committee in January 1941. In October 1941 he relinquished these positions to become general assistant to the vice-president in charge of the distribution staff of General Motors. He later served for 18 months as director of GM's distribution staff in Detroit, and since June 1945 had been director of sales for Electro-Motive. Mr. Dezendorf was born in Portland, Ore., April 23, 1898.

Mr. Turner, who was born in Milan, Ohio, March 29, 1894, is a graduate of University School, Cleveland (1951). He

P. R. Turner

was in the national sales department of the White Motor Truck Company from 1918 until 1921. While establishing branch offices in Denver and Salt Lake City, Mr. Turner became associated with, H. L. Hamilton, wholesale sales manager for White, and the two men started the preliminary planning that led to the establishment of Electro-Motive in 1922. In 1925 Mr. Turner established the first Electro-Motive office in New York where he directed sales activities for Electro-Motive in the eastern half of the United States.

◆

BOGUE ELECTRIC MANUFACTURING COMPANY.—The Bogue Electric Manufacturing Company, 52 Iowa avenue, Paterson, N. J., has announced the formation of a Railway Equipment Division.

Several new products designed specifically for railroad applications will be marketed by the new division. In the railway car lighting field, the company will produce axle generators for passenger cars, rotary converters and motor generators for converting direct current to alternating current, engine-driven car lighting generators, voltage regulators and electric power distribution panels. Several types of automatic battery chargers also will be offered including units which may be permanently mounted under railway passenger cars as well as portable battery chargers for use at yards and terminals. For railroad communication and signaling applications, the division will distribute selenium rectifiers, power supply units and point-to-point radio communications equipment. The line will include "packaged" electric power systems for installation on railroad cabooses for powering radio communications equipment.

◆

WINE RAILWAY APPLIANCE COMPANY.—*E. G. Goodwin* has been appointed consulting engineer of the Wine Company. *Walter L. Floehr* succeeds Mr. Goodwin as mechanical engineer, and *E. G. Goodwin, Jr.,* has been appointed assistant to the mechanical engineer.

◆

STANDARD RAILWAY EQUIPMENT MANUFACTURING COMPANY.—*John A. Brossart,*

J. A. Brossart

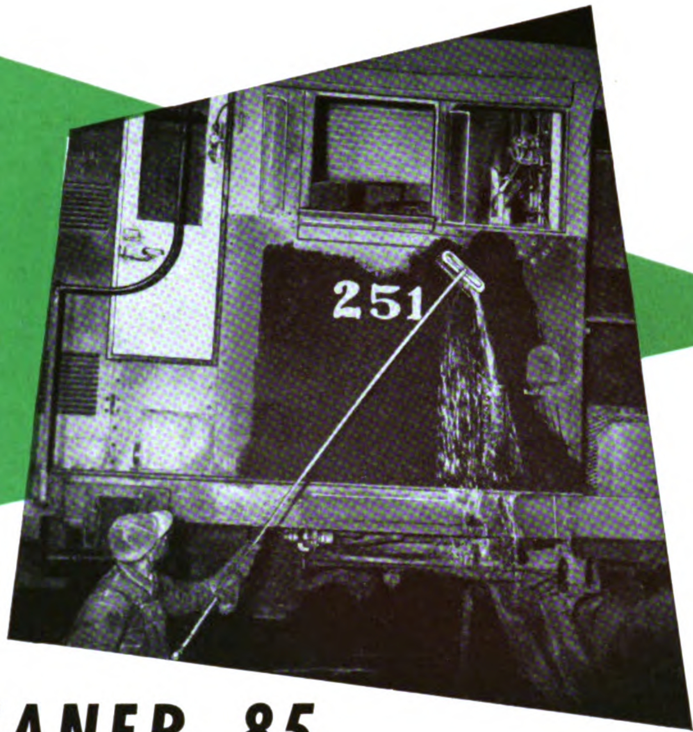
Jr., has been appointed assistant vice-president in charge of production of the Standard Railway Equipment Manufacturing Company, at Hammond, Ind.

◆

ELECTRIC STORAGE BATTERY COMPANY.—*S. Wyman Rolph,* president of the Electric

(Continued on page 124)

shiny new answer to a dirty old problem



PENNSALT CLEANER 85

for EXTERIOR WASHING of DIESELS

You're a diesel maintenance man? Well, let's take a good look at one of your headaches . . . the road or yard engine picking up soot, grease, road dirt and even insects while in service. Not only unsightly . . . but actually a constant fire hazard.

Now comes a handy new answer to this dirty old problem—Pennsalt Cleaner 85. Mildly alkaline—because you know that's best for grease cutting ability on painted surfaces. Streak-free—because you know how important that is in window cleaning. Yet this hard-working cleaner is designed for safety to painted surfaces.

Economical—because you can use it at about half the strength most other cleaners require (1 to 2 oz./gal. against 4 oz./gal. for competitive products). Works well as a manual cleaner or in automatic washers.

Pennsalt Cleaner 85 is carefully compounded to cut grease and dirt away fast, float it off in the abundant suds. It's a dry, free-flowing powder, quickly soluble in hardest water... mild to hands . . . rinses clean in a hurry.

For a real clincher, try a side-by-side test with Pennsalt Cleaner 85. Your Pennsalt Sales-Service representative will be glad to help you set up competitive tests. Use the handy coupon for more information. Maintenance Chemicals Department, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.

Maintenance Chemicals Department
Pennsylvania Salt Manufacturing Co., 1010 Widener Building, Phila. 7, Pa.
Please send more information on Pennsalt Cleaner 85 for economical locomotive cleaning to:

Name__________ Title__________

Company__________

City__________ Zone_____ State__________

PENNSALT CHEMICALS
for Industry · Agriculture · Health · Home

Storage Battery Company, was elected president of the Franklin Institute at the recent annual meeting of the board of managers. Mr. Rolph succeeds *Richard T. Nalle*, president of the Midvale Company.

◆

NATIONAL MALLEABLE & STEEL CASTINGS Co. of Cleveland has contracted to purchase for cash all capital stock of the *Capitol Foundry Company* of Phoenix, Ariz., and its subsidiary, the *Arizona Iron Works*. Both companies will be operated as subsidiaries of National Malleable; *Edward A. Spring*. Capitol's president and general manager, will continue in the same capacity. A $1,500,000 program to expand and improve the Phoenix properties is being undertaken.

◆

CRUCIBLE STEEL COMPANY OF AMERICA.—*Richard C. Lawson* has been appointed assistant manager, railroad and spring sales department, of the Crucible Steel Company of America, with headquarters in New York. Mr. Lawson has been actively associated with Crucible's railroad sales department since joining the company in 1926. For several years he was located at the company's Chicago and Cleveland offices as a sales service engineer.

Richard C. Lawson

◆

TEMPLETON, KENLY & CO.—*Arthur Templeton*, formerly sales engineer in the Chicago area for Templeton, Kenly & Co., has been appointed southwestern divisional sales engineer, with headquarters at 6505 Aberdeen avenue, Dallas, Tex., to cover Texas, Oklahoma and Louisiana.

◆

CECO STEEL PRODUCTS CORPORATION.—*J. E. Grogan* has been appointed vice-president in charge of the eastern district for the Ceco Steel Products Corporation, of Chicago.

◆

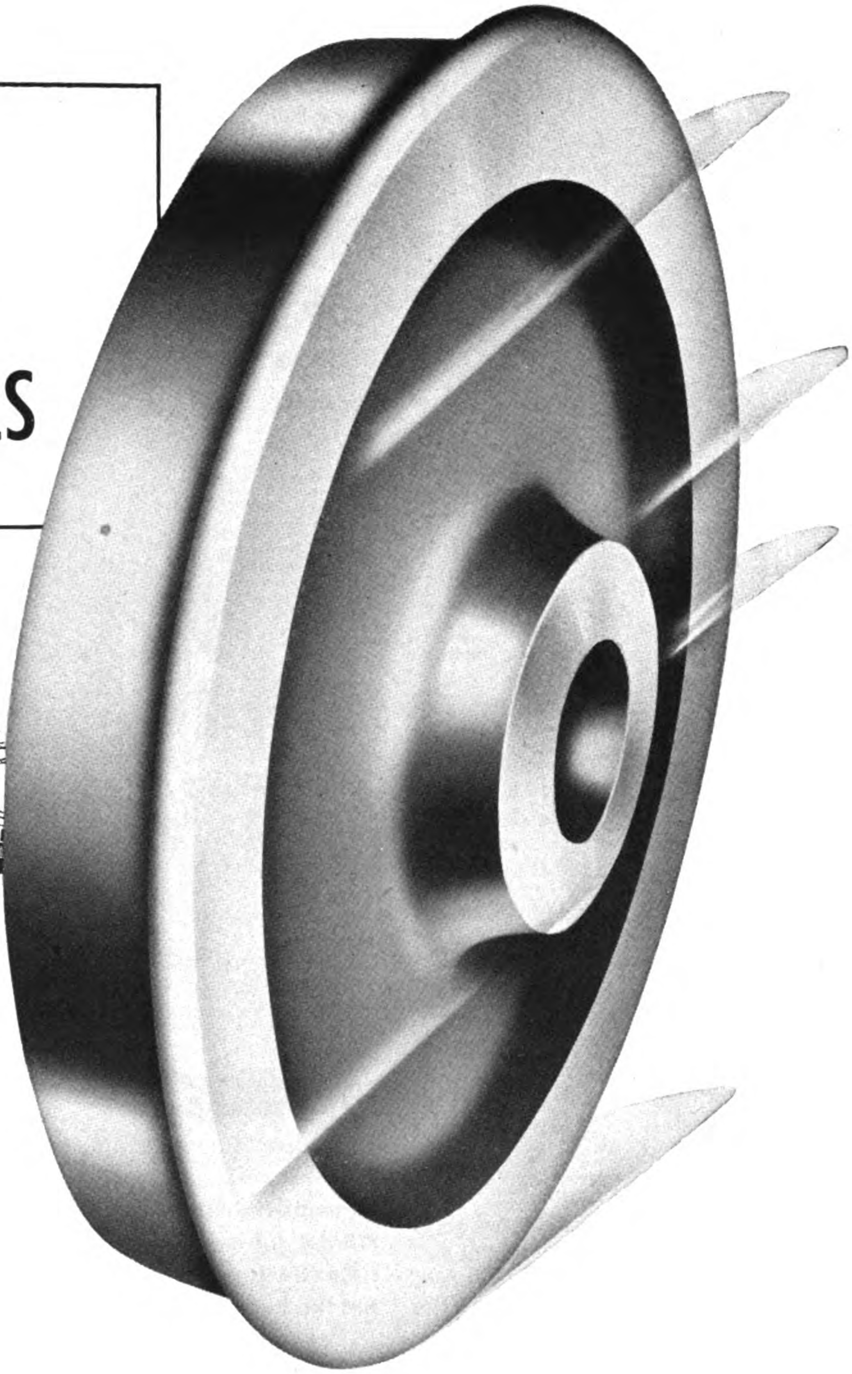
GRANDY RAILWAY EQUIPMENT COMPANY.—*D. R. Myers* has been appointed Chicago railway representative of the Grandy Railway Equipment Company, Cleveland, to succeed *F. W. Evinger*, who has resigned. Mr. Myers formerly was with the company's industrial and railroad department at Cleveland.

◆

BALDWIN-LIMA-HAMILTON CORPORATION.—*Walter A. Rentschler* has been appointed vice-president in charge of the

You can have confidence in

ARMCO WHEELS



Today, more than ever, you want wheels that merit utmost confidence. Higher speeds mean quicker stops—and an increasing need for wheels that will withstand severe braking under passenger cars and the high and complex stresses imposed by Diesel service.

Here is why you can rely on Armco wheels. Sixteen years ago an intensive, permanent program of wheel research was set up. Since then, special laboratory tools have been developed to simulate—and even exceed—the most punishing service conditions.

For example, to study the effects of severe braking, one testing machine brakes a wrought steel wheel at 120 m.p.h. to a stop in 15 seconds, with 20,000 pounds of pressure on each brake shoe. Hundreds of such tests on wheels of different analyses and heat treatment have provided invaluable data.

This never-ending research work, along with the experience of 43 continuous years of wheel-making, is responsible for the present Armco Wrought Steel Wheel. Latest methods of quality control insure uniformity from wheel to wheel—offer you greater peace-of-mind.

It will pay you to investigate Armco Wrought Steel Wheels. Just get in touch with our nearest District Office or write us at the address below.

ARMCO STEEL CORPORATION

2122 CURTIS STREET, MIDDLETOWN, OHIO • PLANTS AND SALES OFFICES FROM COAST TO COAST • EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO

Walter A. Rentschler

Eddystone Division of the Baldwin-Lima-Hamilton Corporation. Mr. Rentschler, who has previously been vice-president in charge of the Lima-Hamilton Division, will continue in charge of the Hamilton plant, which will come under the immediate supervision of *J. F. Connaughton*, who has been appointed general manager of the plant. The Lima Division will continue under the direction of H. F. Barnhart, who will report to M. W. Smith, president of the corporation.

◆

INTERNATIONAL NICKEL COMPANY.—A sound-color film entitled "Corrosion in Action," has been prepared under the direction of the Corrosion Engineering Section of the International Nickel Company, 67 Wall Street, New York 5. The film, in three parts of two reels each, shows how corrosion works to cause an annual loss in industry and elsewhere estimated at over six billion dollars. It also shows how this damage can be avoided or controlled by various means, such as by the selection of corrosion-resistant materials, by the development of new alloys to meet given situations, by the use of electric currents to provide cathodic protection, and by other methods. The film can be shown in one part, in any combination of two parts, or in the full three-part length, depending on the time available. Each part requires 20 min. showing time. Bookings can be made through the Corrosion Engineering Section of the company.

◆

NATIONAL BRAKE COMPANY.—The National Brake Company has acquired the assets of the *Champion Brake division of the Orme Company* of Chicago and Michigan City, Ind. National Brake will continue production and sale of the Champion-Peacock Micro-matic freight-car hand brake in addition to its line of Peacock power hand brake equipment for all other types of rolling stock.

◆

COMBUSTION ENGINEERING-SUPERHEATER, INC.—The business of the *American Throttle Company*, has been acquired by Combustion Engineering-Superheater, Inc. All matters pertaining to sales and service will, as in the past, be conducted by their Superheater Company Division. Orders for locomotive dome or front end throttles,

throttle masters, throttle levers, parts or other correspondence should be addressed to the Superheater Company, Division of Combustion Engineering-Superheater, Inc., 425 West 151st Street, East Chicago, Ind.

◆

Graybar Electric Company.—*R. B. Sayre* has been appointed assistant vice-president of the Graybar Electric Company,

R. B. Sayre

and *D. L. Harper* formerly branch manager at Omaha, Neb., will succeed Mr. Sayre as district manager at Jacksonville, Fla.

D. L. Harper

In his new post, Mr. Sayre will report to G. F. Hessler, vice-president in charge of sales at New York.

◆

C. Raymond Ahrens, Inc.—*A. L. Sutherland,* formerly with Manning, Maxwell & Moore, has joined the sales department of C. Raymond Ahrens, Inc., as chief engineer, representing the company in the New York area.

◆

Cummins Engine Company.—*John T. Weber* has been appointed manager, sales development, at Columbus, Ind., succeeding Howard P. Sharp, who has resigned.

◆

Fairbanks, Morse & Co.,—*J. W. Elwin* has been appointed sales representative of the diesel locomotive division in the Chicago area for Fairbanks, Morse & Co. Mr. Elwin formerly was with the Great Northern and later with the Chicago &

Eastern Illinois of Danville, Ill. C. E. Dietle has been appointed manager of the diesel sales division of Fairbanks, Morse.

Mr. Dietle started with the company as a salesman in 1926, spending several years in the Detroit and Toledo areas. He was transferred to Chicago in 1944, and was diesel department manager of the Chicago branch prior to becoming manager of the diesel sales division.

◆

UNION ASBESTOS & RUBBER CO.—*John F. Corcoran* has been appointed director of sales for the Union Asbestos & Rubber Co., with offices in Chicago.

Mr. Corcoran was associated with several investment and construction business firms

John F. Corcoran

before joining the American Locomotive Company in New York in 1940. He served that company at Washington, D. C., and Atlanta, Ga., and in 1948 was transferred to the Chicago office as assistant to the vice-president. In 1950 he opened his own office in Washington, and represented several firms in the railway supply industry, including Union Asbestos & Rubber, Standard Railway Equipment Manufacturing Company, Spring Packing Corporation, Peerless Equipment Company, and Pyle-National Company.

◆

SIMMONS-BOARDMAN PUBLISHING CORPORATION.—*Fred W. Smith*, sales representative for Railway Mechanical and Electrical Engineer and other railway publications of

Fred W. Smith

the Simmons-Boardman Publishing Corporation, has been elected vice-president of the corporation.

Mr. Smith was born at Coal Valley Ala., on December 31, 1910, and received his education in structural engineering from the International Correspondence Schools. He entered railroad service in 1937 as a rodman-transitman for the Birmingham Southern at Birmingham, Ala., where he remained until 1941, when he became railroad engineer for Alford Burdick & Howson, consulting engineers, Chicago. In 1942 he joined the Chicago, Rock Island & Pacific as an engineer-estimator, and in 1945 became associate editor on the *Railway Engineering & Maintenance Cyclopedia.* a Simmons-Boardman publication. From 1946 to 1947 he was associate editor in the purchases and stores department of *Railway Age,* and in the later year was appointed sales representative.

◆

Fafnir Bearing Company; Waugh Equipment Company.—The Fafnir Bearing Company, of New Britain, Conn., and the Waugh Equipment Company, of New York, have jointly announced discontinuance of the manufacture and sale of Fafnir-Waugh railway journal bearings, because of the increasing demands of the defense program for ball bearings, Fafnir's major product, and a limit to available facilities for their production.

◆

Walter R. Collins Company and Collins Oil & Manufacturing Co.—*J. Donald Hadden,* Pittsburgh, has joined the Walton R. Collins Company and the Collins Oil & Manufacturing Co. to handle Rust Oleum products and Hanlon & Wilson Company Bonds. Mr. Hadden formerly was with the Universal Cyclops Steel Company and also was production engineer with the United States Army Ordnance department.

J. Donald Hadden

◆

Peerless Machine Company.—*C. O. Wanvig, Jr.,* formerly secretary of the Peerless Machine Company, Racine, Wis., has been elected president, to succeed the late *J. R. McDonald. Lee P. Thomas,* has joined Peerless as sales representative at the company's general office at Chicago. Mr. Thomas was formerly with the Baldwin-Lima-Hamilton Corporation's transportation division.

L. P. Thomas

◆

Quaker Rubber Corporation—*J. R. Lewis* has been appointed general sales manager of the Quaker Rubber Corporation, division of the H. K. Porter Company, Philadelphia.

Mr. Lewis has been with Quaker Rubber for more than 11 years and has been,

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oil R.R.

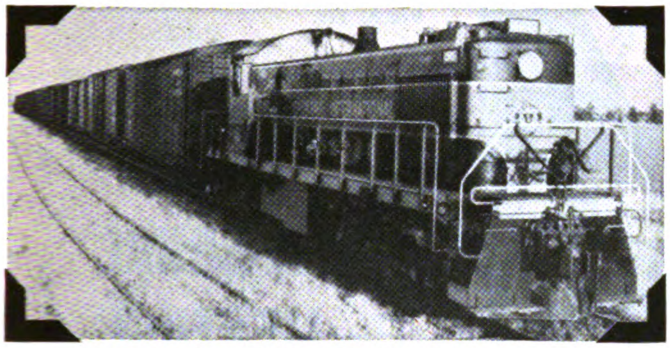
UNIT Alco Diesel – 6 cyl. 12½" x 13" – 1000 H.P.

SERVICE Mountain haul – Heavy snow, extreme cold

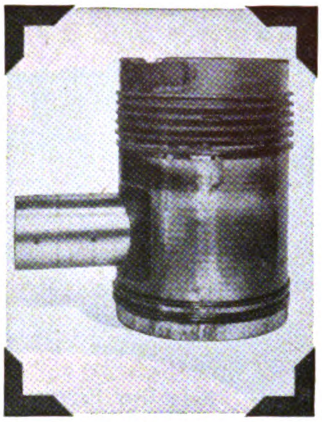
LOCATION Spokane, Wash. – Yahk, B.C.

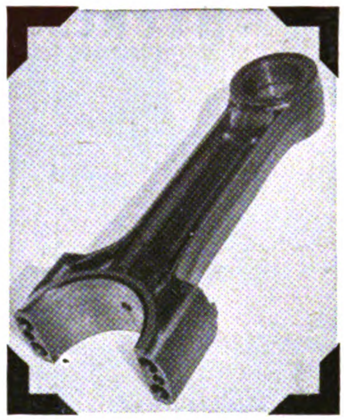
FIRM Spokane International R.R. Co.

Engines in "perfect condition" after year of toughest service!

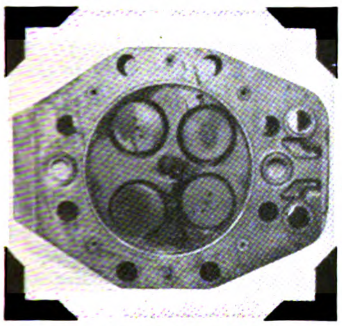


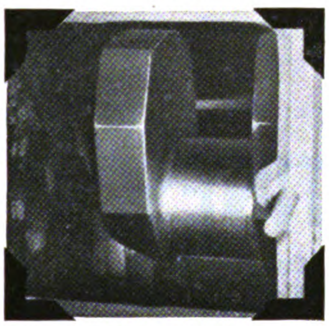
LUBRICATED WITH RPM DELO Oil R.R., nine new diesels owned by the Spokane International R.R. Company were kept in regular service for one year. The winter was exceptionally severe and the locomotives bucked heavy snow almost daily. They worked or were idled in temperatures that often for periods of ten days averaged from 20 to 40 degrees below zero.





On inspection at the end of that time there were no accumulations of sludge in oil systems and the engines were in "perfect condition" as pictures of parts from one of them indicate.



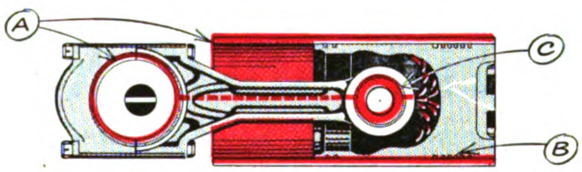


NO CARBON had collected on the cylinder head and all rings were free and functioning properly. Connecting-rod and main bearings and wristpin were within standard tolerance. Measurement of the liner showed less than 0.001 inch wear.

REMARKS: The Spokane International Railroad provides an important connecting service between transcontinental lines through Spokane and the Canadian Pacific to the north. Most of their trackage is in northern Idaho where severe weather and other conditions often make operation difficult. RPM DELO Oil R.R. will meet the toughest weather or operational conditions in all locomotive diesel engines.

RPM DELO LUBRICATING OILS

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities... keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer... prevents ring-sticking. Detergent keeps parts clean... helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of bushing or bearing metals and foaming in crankcase.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver I, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

successively, Philadelphia district sales manager, assistant sales manager and assistant general sales manager. As general sales manager, he will be in complete charge of the sales organization of the company.

◆

Detrex Corporation—*P. W. Moehle* has been appointed sales manager of national accounts for the Detrex Corporation, Detroit 32.

◆

Minneapolis - Honeywell Regulator Company.—*Milton L. Edgren* has been appointed field service engineer in the transportation division of the Minneapolis-Honeywell Regulator Company, at Minneapolis.

◆

United States Steel Company.—*John S. Ewing* has been appointed manager of stainless steel sales for the United States Steel Company at Pittsburgh.

Obituary

Joseph C. Snyder, vice-president in charge of sales for the Pullman-Standard Car Manufacturing Company, died on February 17. Mr. Snyder began his business career in the New York Central's purchasing department. He later joined the Richmond Car Works, where he was subsequently appointed a vice-president. The Richmond company was acquired by the Standard Steel Car Company, of Pittsburgh, Pa., and the latter, in turn, by the Pullman Company to form the Pullman-Standard Car Manufacturing Company. Mr. Snyder turned his attention to sales for the newly formed company and was appointed a vice-president. He had charge of Pullman-Standard's Cleveland, Ohio, office from 1931 until his retirement in 1949.

◆

Oliver S. Lyford, 81, electrical engineer and consultant, who participated in the construction of Pennsylvania Station at New York, died on March 6, at Daytona Beach, Fla.

◆

T. M. Ferguson, 67, New England sales and service representative for the Brandon Equipment Company, of Chicago, died on January 17.

PERSONAL MENTION

General

H. L. Bullock has been appointed superintendent of motive power of the Akron, Canton & Youngstown at Akron, Ohio.

J. E. Potts, assistant to superintendent of motive power of the St. Louis-San Francisco, has been appointed assistant to chief mechanical officer, with headquarters as before at Springfield, Mo.

John E. Wightman, Jr., superintendent motive power-diesel, Central region, of the Pennsylvania at Pittsburgh, has been appointed superintendent of the Lake division with headquarters at Cleveland. Mr. Wightman a graduate of Lehigh University, entered the service of the Pennsylvania in 1928 as a draftsman at Philadelphia. He

John E. Wightman, Jr.

served successively as machinist, inspector foreman and master mechanic, until 1948 when he was named superintendent motive power of the Western Pennsylvania division. Mr. Wightman was appointed superintendent motive power—diesel, Central region, at Pittsburgh, on November 1, 1950.

C. H. LOCKHART has been appointed superintendent of motive power and car equipment of the Central Vermont, with headquarters at St. Albans, Vt.

H. A. SCHNITZ, engineer of tests of the Chicago, Rock Island & Pacific at Chicago, has taken a leave of absence.

J. W. ECKSTEIN, superintendent motive power and cars of the Akron, Canton & Youngstown at Akron, Ohio, has retired after 32 years of service.

J. E. TIEDT, engineer of water service and work equipment of the Chicago, Rock Island & Pacific, has been appointed engineer of tests, with headquarters in Chicago.

HARRISON L. PRICE, superintendent of shops of the Atchison, Topeka & Santa Fe, at Albuquerque, N. M., has been appointed mechanical assistant at Chicago. Mr. Price entered Santa Fe service as a machinist apprentice at Topeka, Kan., in 1916. He was successively clerk, machinist, engine inspector, apprentice instructor, welder, test department assistant, car gang foreman, air-brake foreman, and acting superintendent of Chicago car works, until his appointment as superintendent Chicago car works in 1941. He became master mechanic at Chanute, Kan., in 1943, and in April of that year master mechanic to Chicago, where he served until 1949, when he was appointed superintendent of shops at Albuquerque.

MAX C. HABER, general mechanical engineer of the Union Pacific at Omaha, has assumed the duties of research and standards engineer, at Omaha. Mr. Haber is a graduate of the University of Nebraska, with a degree in mechanical engineering. He joined the U.P. in 1922 as a tracer, and has served as draftsman, engineer of road tests and mechanical engineer.

HOWARD H. MELZER, assistant mechanical engineer of the Chicago, Milwaukee, St. Paul & Pacific at Milwaukee, has been appointed mechanical engineer. Mr. Melzer started with the Milwaukee in 1936 following graduation from Marquette University where he received the degree of bachelor of civil enginering. Subsequently he has been production engineer, dynamometer engineer, assistant engineer of tests, and since 1949, assistant mechanical engineer.

J. A. LONG wrecking engineer of the Seaboard Air Line, has been appointed foreman of the car and locomotive department at Monroe, N. C.

D. M. BRESSETTE has been appointed mechanical engineer of the Central Vermont at St. Albans, Vt.

FRANK FAHLAND has been appointed general mechanical engineer of the Union Pacific at Omaha. After graduating from the University of Minnesota college of engineering, Mr. Fahland served as a draftsman for the Northern Pacific in 1923. He joined the U.P. in 1936 as assistant engineer of design and material.

L. H. BEXON has been appointed director of training in the mechanical department of the Canadian National. The duties of Mr. Bexon who was formerly supervisor of apprentice training, have been extended to include supervision over all training and educational programs in the mechanical department as well as diesel training.

Diesel

E. H. DAVIDSON, JR., has been appointed diesel supervisor of the Akron, Canton & Youngstown.

G. R. WEAVER, master mechanic, Maryland-Delmarva division of the Pennsylvania at Wilmington, Del., has been appointed superintendent motive power-diesel, Central region, with headquarters at Pittsburgh.

Electrical

J. W. LUKE, day diesel enginehouse foreman of the Atchison, Topeka & Santa Fe at Argentine, Kan., has been appointed general supervisor of diesel engines at Chicago.

(Turn to page 140)

Shop and Enginehouse

J. B. Roman, special engineer for the Chesapeake & Ohio at Richmond, Va., has been appointed shop engineer at Richmond. Mr. Roman was born in Bradley, Ohio, on February 15, 1908, He received his B.S. in M.E. at the University of Pittsburgh in 1931, and from June 1924 until July 1931 was variously employed as a coal loader; as a tile and terrazo setter helper; in the repair and testing and electrical equipment; as an instrument man and coal and coak sampler; as an inspector of automobile motors, and as a physical tester in an airplane plant. He then began service with the C. & O. as a special apprentice at Huntington, W. Va. In November 1936 he became an assistant in the physical testing laboratory at Huntington; in May 1937 material supervisor at Richmond; in August 1941 pattern supervisor; in September 1944, special engineer; in June 1949 acting shop engineer, and in November 1949 special engineer. Mr. Roman, on leave of absence from the C. & O., was mechanical consultant for the Orinoco Mining Company at New York from January 1951 until April 1951. He then returned to Richmond as special engineer for the C. & O., and in July 1951 was appointed acting shop engineer.

J. B. Roman

R. F. Dollard shop engineer of the Chesapeake & Ohio at Richmond, Va., has retired.

D. J. Everett, master mechanic of the Atchison, Topeka & Santa Fe at Galveston, Tex., has been appointed superintendent of shops, at Albuquerque, N. M.

Master Mechanics and Road Foremen

H. J. Scholz has been appointed road foreman of engines of the Michigan Central district of the New York Central at Detroit.

(Turn to page 142)

Master Mechanics and Road Foremen

(Continued from Page 140)

KENNETH J. ICKES has been appointed assistant road foreman of engines, Michigan Central district, of the New York Central at Jackson, Mich.

F. H. RUSSELL, road foreman of engines of the Michigan Central district of the New York Central at Detroit, has retired after 49 years of service.

L. A. DIXON, assistant master mechanic of the Fort Wayne division of the Pennsylvania, has been appointed master mechanic of the Susquehanna division, with headquarters at Williamsport, Pa.

E. H. LEWIS, assistant road foreman of engines of the Fort Wayne division of the Pennsylvania, has been appointed assistant road foreman of engines, New York division.

J. H. KERVIN, general foreman for the Chicago, Milwaukee, St. Paul & Pacific, at Chicago, has been appointed master mechanic of the Rocky Mountain division, with headquarters at Deer Lodge, Mont.

L. L. LUTHEY, general supervisor of diesel engines of the Atchison, Topeka & Santa Fe at Chicago, has been appointed master mechanic at Galveston, Tex.

W. E. BRAUTIGAM, master mechanic of the Chicago, Milwaukee, St. Paul & Pacific at Deer Lodge, Mont., has retired.

A. R. MARSH, master mechanic of the Susquehanna division of the Pennsylvania at Williamsport, Pa., has been appointed master mechanic of the Maryland-Delmarva division, with headquarters at Wilmington, Del.

Electrical

J. J. MILLER, mechanical and electrical superintendent of the Niagara, St. Catharines & Toronto (Canadian National) at St. Catharines, Ont., has been appointed electrical superintendent, St. Clair Tunnel, at Port Huron, Mich.

Car Department

RAYMOND KNORR, division car foreman of the Erie at Marion, Ohio, has retired.

C. E. MATTHEWS, supervisor of the car department of the Seaboard Air Line at Hamlet, N. C., has been appointed foreman of the car department at Baldwin, Fla.

HAROLD D. MCCONAHY, division car foreman of the Erie, at Meadville, Pa., has been transferred in the position of division car foreman at Marion, Ohio.

P. A. GANTT, foreman of the car department of the Seaboard Air Line at Baldwin, Fla., has been appointed supervisor of the car department at Hamlet, N. C.

F. F. LENTZ, superintendent of the Akron, Canton & Youngstown at Akron, Ohio, has assumed supervision of the car department in addition to his duties as superintendent.

ROY RADFORD, general foreman of the car department of the Seaboard Air Line at Hamlet, N. C., has retired.

H. B. PARDUE, supervisor car department of the Seaboard Air Line at Raleigh, N. C., has been appointed general foreman of the car department at Howells, Ga.

R. H. STUBBERFIELD, general foreman of the car department of the Seaboard Air Line at Atlanta, Ga., has been appointed general foreman of the car department at Hialeah, Fla.

Obituary

W. D. TAYLOR, 49,, electrical engineer of the Central region of the Canadian National at Toronto, Ont., died on February 20. Mr. Taylor was an active member of the Electrical Section of the Association of American Railroads. He was born at Ottawa, Ont., on December 18, 1902, and attended McGill University (B.Sc. 1927). He entered railroad service in 1927 as electrical inspector on the C.N., and was appointed assistant electrical engineer in 1929. Mr. Taylor was engaged in sales engineering and general engineering, railway and industrial equipment, from 1931 to 1946. In the latter year he became electrical engineer of the Central region of the C.N.

NEW DEVICES

(Continued from page 113)

the No. 751 cleaner with two parts of water was then pumped through the exchanger. Heat was maintained through steam at 140 deg. F.

This solution was circulated for 8 hr., then discarded and a fresh solution pumped through for 10 hr. in a reverse direction. At the end of this period, the solution was left in the exchanger for 14 hr. When finally drained and flushed with water, a clean system was obtained.

◆

New Thor Impact Wrench

A new Thor 3/8 in. portable pneumatic reversible impact wrench, recently announced by Independent Pneumatic Tool Company, Aurora, Ill., features the same basic impacting mechanism as the universal electric impact tools made by this company for industrial and railroad use.

Exceptional power and long service life are credited to an exclusive rolling ball-type cam which increases efficiency and steady functioning of the impacting mechanism. The new wrench is available with two types of spindles having 1/2 in. square drive, or a 7/16 in. hexagon quick-change chuck integral with the spindle.

The wrench weighs only 5 3/4 lb. and is 8 11/16 in. long. A reversing valve is conveniently located at the back of the tool which can be equipped for either vertical or horizontal suspension on assembly lines.

An air motor transmits power to the impact mechanism through a torque-increasing planetary gear system. All heat treated alloy steel gear elements, precision finished, are mounted in full anti-friction bearings, providing extra power for heavy service and long life. Drawing loads and quick run-down of the nuts are easily accomplished for types of screw fastenings.

Additional features include extra large rotor pinion and idler gears, easily-operated throttle control, comfortable hand grip, self-contained oil reservoir which automatically meters exact lubrication requirements of tool and rota-type impact jaws.

◆

Bearing Lubricant

An improved multi-purpose grease for use in general industrial applications—Texaco Multifak 2 Grease—has been introduced by the Texas Company, New York. It

(Continued on page 150)

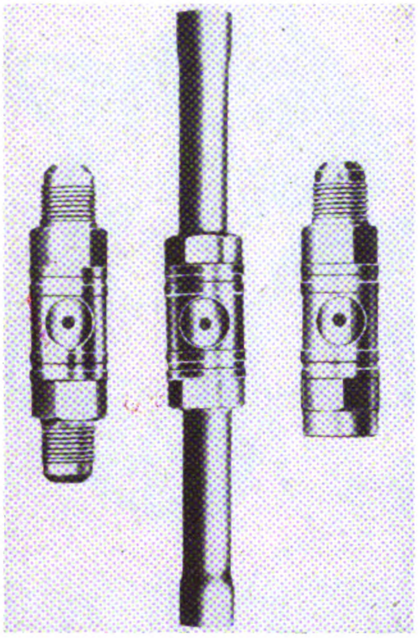
NEW DEVICES

(Continued from page 144)

is recommended for use in situations which require one high grade multi-purpose grease for a variety of operations.

Research officials responsible for the new formulation point out that Multifak has excellent shear stability, outstanding resistance against water washing, and good pumpability at low temperatures. It is highly suitable for bearing lubrication over a wide range of temperatures and can be used efficiently for an extensive variety of industrial lubrication jobs.

◆



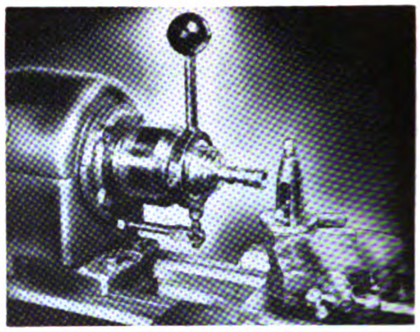
Flow Line Indicator

A visual flow line indicator is now available which is incorporated into the line and permits instant inspection without reading pressure gauges. Known as the Liquid Eye, this indicator manufactured by the Allin Mfg. Co., Chicago 22, consists of a brass housing in which is inserted a transparent high pressure Pyrex tube with a ceramic eye. This eye visually magnifies when the liquid line is full. Construction is such that it is not affected by commonly used chemicals, solutions and oils.

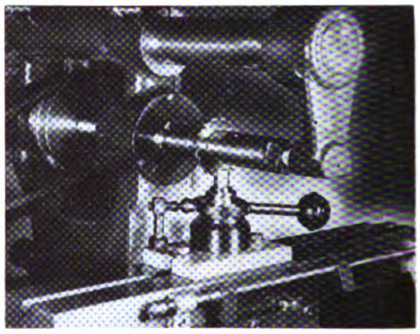
Assembly is completed with torque wrenches to secure uniformity and the indicator is so light in weight that there is practically no fatigue factor in the liquid line. Each unit is tested under conditions which simulate a pressure surge when a valve is opened.

These indicators are practical in boiler feed water conditioner lines, in oil pressure lines, diesel fuel lines, refrigerant and other chemical lines, where a positive check of flow is required.

Three styles are available in copper tube sizes of ¼, ⅜, ½ and ⅝ in. with male flare ends, female to male flare ends with copper flare insert in the female end, or with solder connections.



The Davo draw collet chuck accommodates all round, square, hexagonal and plain or serrated type draw collets



The Davo collet chuck in use on a standard milling machine

Draw Collet Chuck

The Davo Collect Chuck is designed for adaption to any model lathe, as well as to drill presses, grinders and milling machines. It has a simple opening and closing lever action which permits loading and unloading while the lathe is in motion. Any type spindle stop may be used in the lathe, and the collet will not move from permanent gripping operation due to a special feature known as the permanent stop. The lathe above the spindle bore may be employed for second operation uses.

A pair of fingers on the chuck housing which act to lock the workpiece in place also eliminate wearing the clutch bushing in the same spot from constant opening and closing. The collet threads are claimed to last longer because forcing is not necessary to tighten the collet in gripping position.

The chuck is made from hardened and ground alloy steel, and accommodates round, square, hexagonal and plain or serrated draw collets. It has no bearings, washers or retainers, and hence requires no lubrication.

The Davo collet chuck is available in five sizes from the Stallion Manufacturing Co., 2017 N. Halsted street, Chicago 14. Capacities of the smallest sizes are 1/16 to ½ in., the largest size, 1/32 to 1¾ in.

◆

Mica Insulation for Traction Motor Coils

Mica mat, a paper-like material, made of matted flakes of mica, is being used for ground insulation in the General Electric Company's Locomotive and Car Equipment Department at Erie, Pa.

Developed in Europe, mica mat is manufactured by G.E. in a newly-adapted proc-

ess similar to paper making. General Electric engineers state that the operation at Erie is one of the first American production uses of this type of ground insulation.

Mica mat is being used in both armature windings and field coils in the manufacture of some motors and generators for electric and Diesel-electric locomotives at Erie.

This material will stand about 600 volts per mil of thickness. Its thickness is uniform within a fraction of a mil, and the thickness of a taped or wrapped conductor is now more constant than was possible with mica-glass cloth insulation. Engineers point out that mica mat also has fewer electrical "holes" than mica-glass cloth.

The manufacture is done by baking mica at 700-800 deg. C. and then suddenly quenching it with cold water, causing the mica to explode into tiny flakes. The water-mica slurry is then fed into a paper-making machine and comes out as a dry, fragile paper. This paper is impregnated with a heat-resisting silicone varnish and applied to glass cloth for use as wrappers. The finished product meets the specifications of Class H insulation.

◆

Aluminum Lamp Bases

The General Electric's Lamp Department is now using aluminum instead of brass for a large portion of its output of bases for incandescent electric light bulbs. Aluminum is being employed to conserve the scarcer brass for the nation's military needs.

The aluminum-based lamps are said to be identical in life, efficiency and cost to the familiar brass-based lamps. The new bases have the advantage of being resistant to tarnishing, and of maintaining a better appearance.

Adaptation of aluminum for lamp bases is considered by the aluminum industry to be one of the most important recent developments in the application of this metal. It is the outgrowth of several years' research and development by metallurgists of General Electric, major aluminum producers, and solder manufacturers.

In 1947, considerable work was done in the development and testing of aluminum for bases for fluorescent lamps, and in 1948, this metal was made the standard for all fluorescent lamp bases. During the same period, and thereafter, investigations were going on with the hope of later using aluminum for incandescent lamp bases.

The successful use of this metal for incandescent bulbs required an aluminum alloy which would withstand the high temperatures used by machines on which lamps are assembled. It also required the development of a solder and a flux suitable for a high-speed automatic soldering operation. This operation involves attaching to the shell of the base a wire which leads to the filament.

In addition, it was necessary to make exhaustive tests concerning such matters as electrolytic corrosion in brass and copper sockets, corrosion characteristics in various atmospheres, and contact resistance between the base and socket.

Development of the corrosion-resistant aluminum alloy, a special flux and a solder in wire form now for the first time makes the use of aluminum bases practicable.

In addition to maintaining a better appearance than brass bases, the aluminum boasts such advantages as having excellent electrical properties, being two and one-half times as good a conductor of electricity, and having greater resistance to acids and a variety of atmospheres.

It is expected that aluminum may become the standard metal for most lamp bases whenever the metal supply situation returns to normal. Until that time arrives, both brass and aluminum probably will be used.

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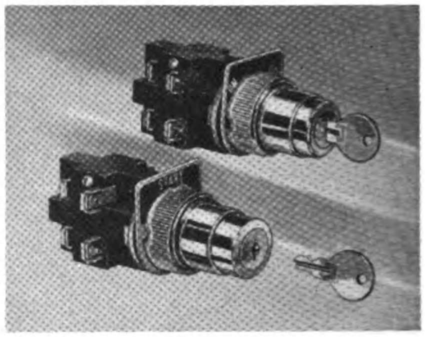

Key-Operated Pushbuttons

Key-operated cylinder-locks for oil-tight pushbuttons are available from the Westinghouse Electric Corporation. The locks come in two basic types: the selector switch, which has either two or three rotary positions; or the pushbutton type, which can be depressed in either full or intermediate positions. Several models cover virtually all possible conditions. For example, the pushbutton type allows the key to be removed in the depressed position, in the undepressed position, or in both; and, similarly, the selector-switch type allows the key to be removed in any one or all of the various positions.

The cylinder locks are mounted in place of the standard operator on Class 15-022 Oil-Tite pushbuttons for panel mounting, or in surface-mounting or flush-mounting stations. All operators of the complete Oil-Tite line are mounted in identical round holes in panels varying in thickness from 1/16 in. to 1/4 in. without requiring an extra gasket.

The single- or double-pole contact blocks can be mounted either in the bottom of the box or on the operator.

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QUESTIONS AND ANSWERS:

ELECTRICAL SECTION:

EDITORIALS:

NEW DEVICES:

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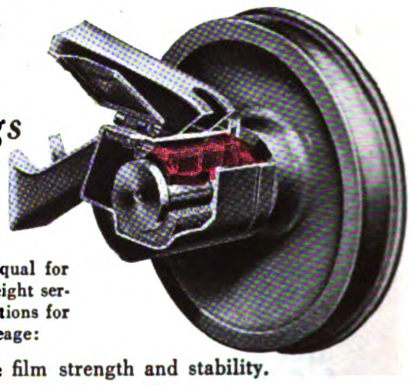
Here are some important maintenance facts about *Low-Cost Solid Bearings*

Improving maintenance and inspection practices can shorten the gap between on-line and interchange performance of solid journal bearings



Routine yard maintenance of solid journal bearings requires fewer man-hours, less skill, and simpler facilities than would be required for any high-cost roller bearing installation. That's true of both interchange and on-line service.

But for low-cost solid bearings to operate in interchange with the higher efficiency that's obtained on-line, it's important that maintenance and inspection practices be up to the standards required. Oils of greater film strength and stability are a primary need. Journal packing should, but often doesn't, meet AAR specifications.

And adequate on-job training to teach the hows and whys of doing the job right, can really pay off in reduced hot box and operating expense. One large railroad has recently initiated a program that calls for car foremen in freight yards to hold ½ hour instruction periods each week. Just watch this railroad's bearing performance improve! Magnus Metal Corporation, 111 Broadway, New York 6; or 80 E. Jackson Blvd., Chicago 4.

This simple solid journal bearing assembly has no equal for real economy in modern freight service. Here are a few suggestions for maximum trouble-free mileage:

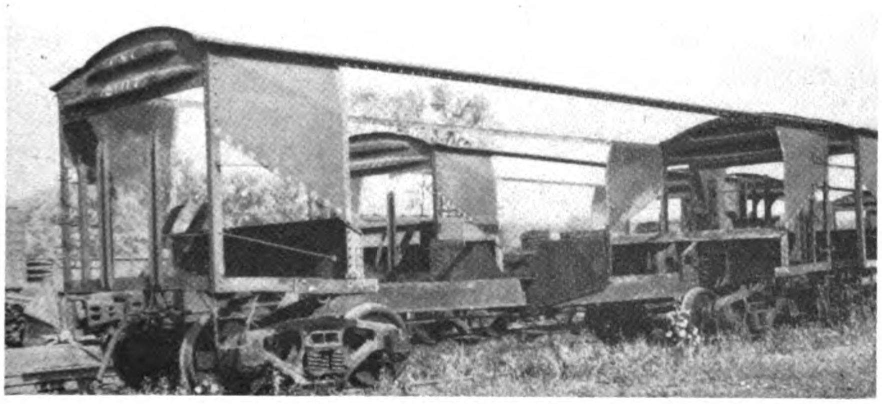
1. Use oils of adequate film strength and stability.
2. Make sure waste meets AAR specifications.
3. Repack at specified 12-month intervals.
4. Inspect bearings *after* switching.
5. Train and supervise your maintenance crews.

MAGNUS

Solid Bearings

Right for Railroads ...in performance...in cost

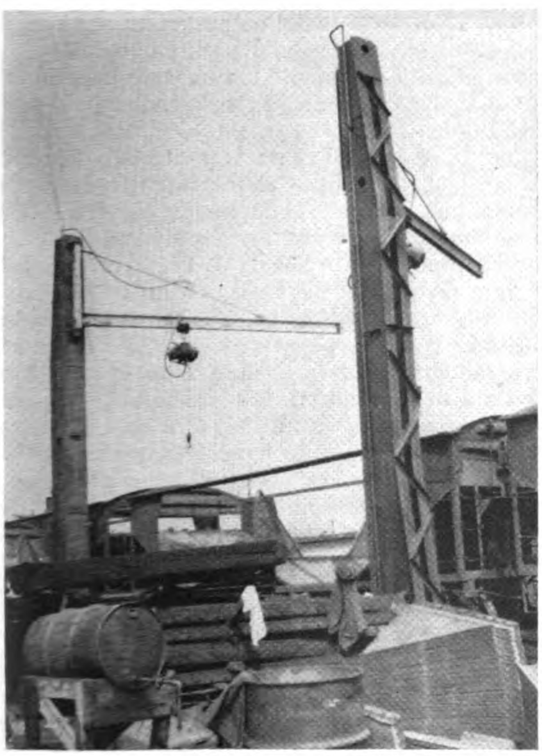
MAGNUS METAL CORPORATION *Subsidiary of* **NATIONAL LEAD COMPANY**

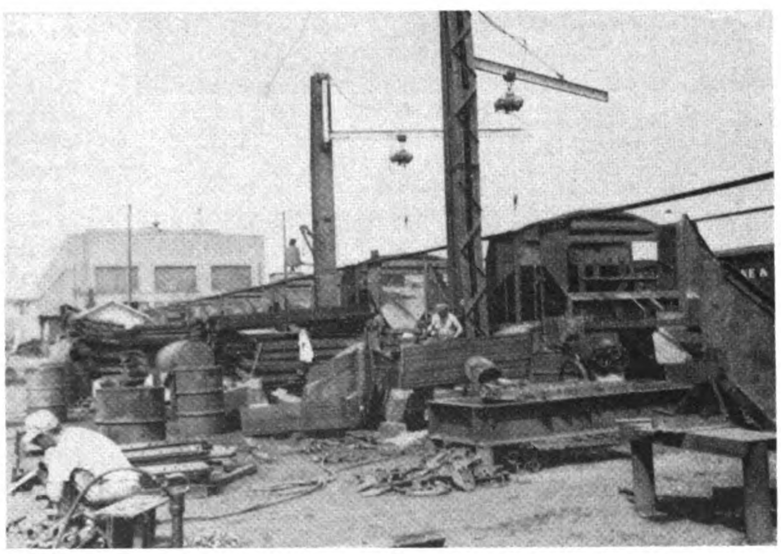


The degree to which the hopper cars were stripped preparatory to rebuilding.

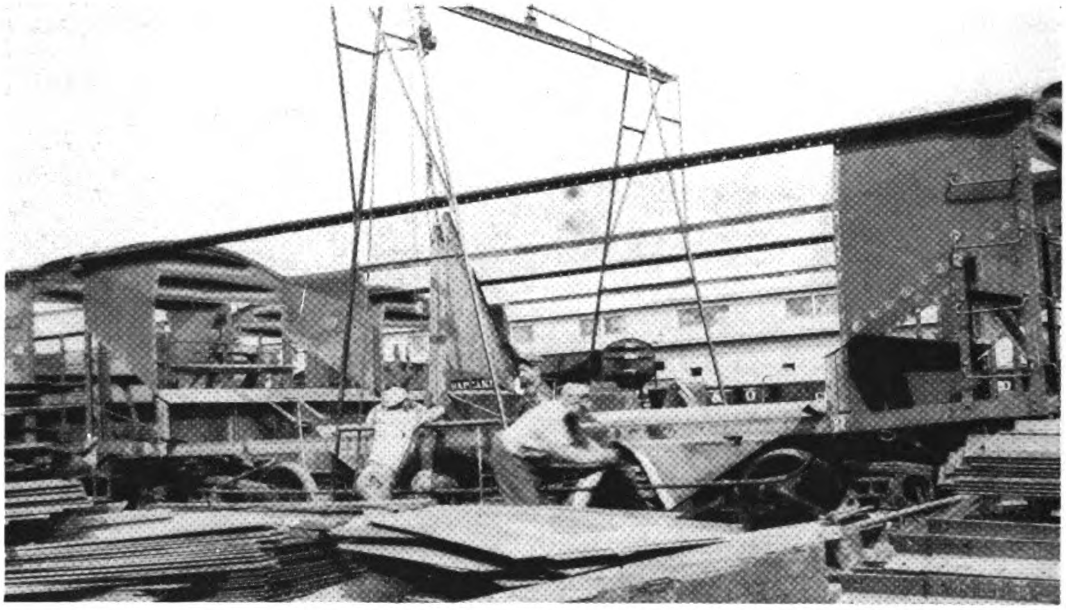
Unique Use Made of Shop in C. & O. Hopper Rebuilding

Outdoor production line so set up that shop at end eliminated most delays due to weather

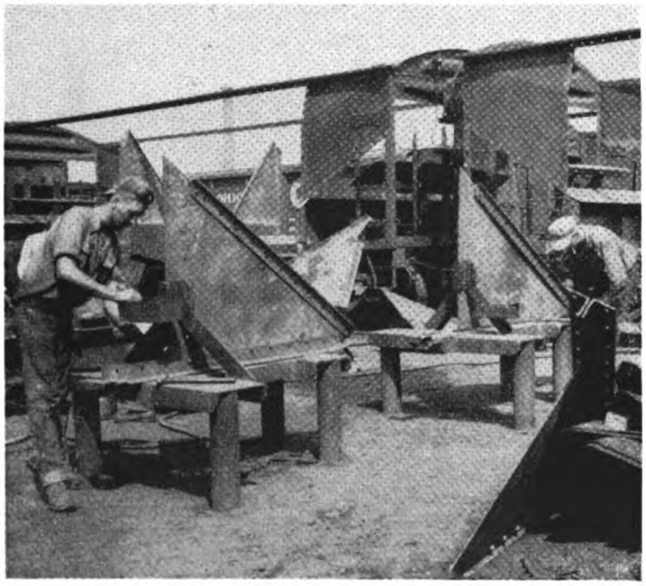




Two jib cranes, made from box-car center sills handle the application of center-ridge gussets and floor sheets. The car shop is shown in the background of the assembly at the right.



The large rubber-tired A-frame shown hanging a new center ridge gusset top section performs an important function in rainy weather. A canopy is hung by the traveling hoist over the bulb angles to protect the second position, which is the key position at which work must be completed in order to permit subsequent operations to be carried on.



Fitting up the new gussets preparatory to riveting on the jig.

THE Chesapeake & Ohio has rebuilt 1,385 50-ton hopper cars at the Wyoming shops of the Pere Marquette District in Grand Rapids, Mich. The work was done in 7 stripping and 17 assembly positions on a single track about 800 ft. long, all outdoors except for the final 327 ft. which is enclosed in a car shop building.

Despite the fact that over half of the production line was out of doors, a full day's output could be attained in the event of rain. This was accomplished primarily by the layout of the production line, aided by an arrangement for shielding the key outside position with a canopy while rain is falling.

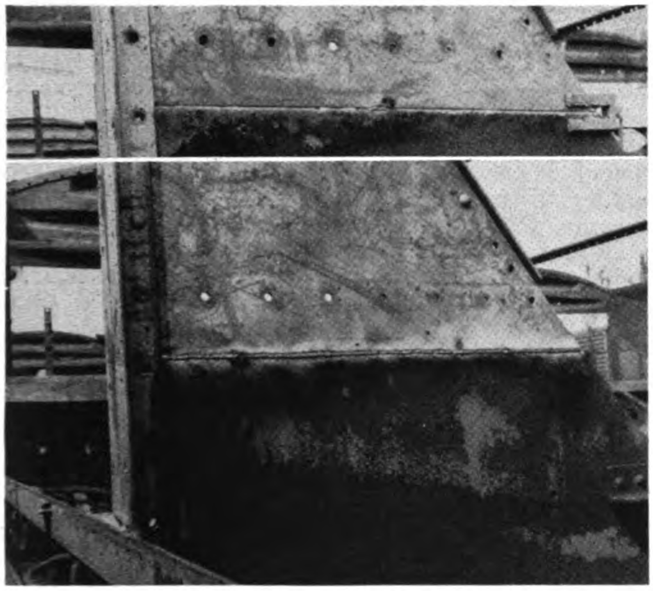
The production line was laid out with a nonworking, or hold, position between the end of the outdoor portion of the line and the beginning of the indoor portion. The seven stripping positions and nine of the assembly positions preceded the holding position; seven, beside painting, followed it, leaving seven cars to be worked on in the shop. The operations which would have been slowed up when it rained included the application, and the riveting or welding, of all major parts except side sheets, side posts, end sheets, splice plates and hopper doors.

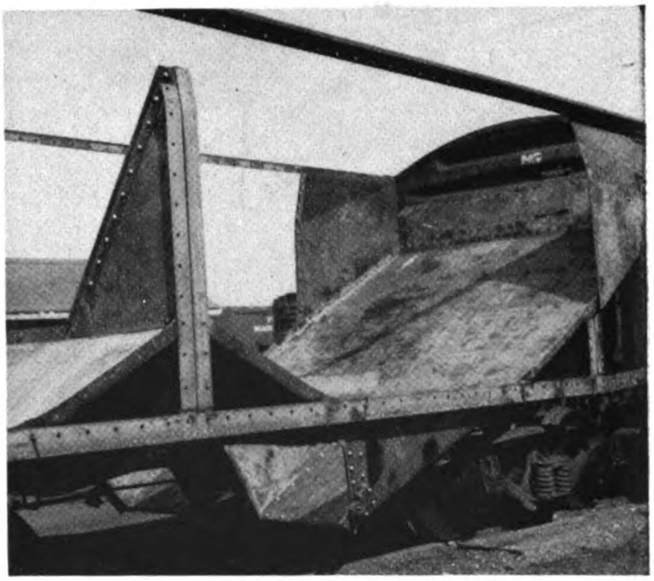
The hold position, by providing an extra car or cars to put in the shop to augment the seven already in, avoided the decrease in the daily output of finished cars that would otherwise have occurred when the above operations were slowed down. Thus, if the daily output quota were seven cars, keeping one car at the hold position furnished an eighth car to go into the shop. If two were kept in the hold position, nine cars could be completed despite weather conditions.

Production of the 1,385 cars was started April 2, 1951, and originally scheduled at the rate of seven cars per day minimum, getting eight on some days. It was increased to ten per day beginning September 17, 1951. With the final production schedule of ten cars per day, four cars were retained at the hold position. The extra cars served as insurance that seven, plus the four retained at hold position, could be completed whether or not full speed were maintained at preceding outside positions.

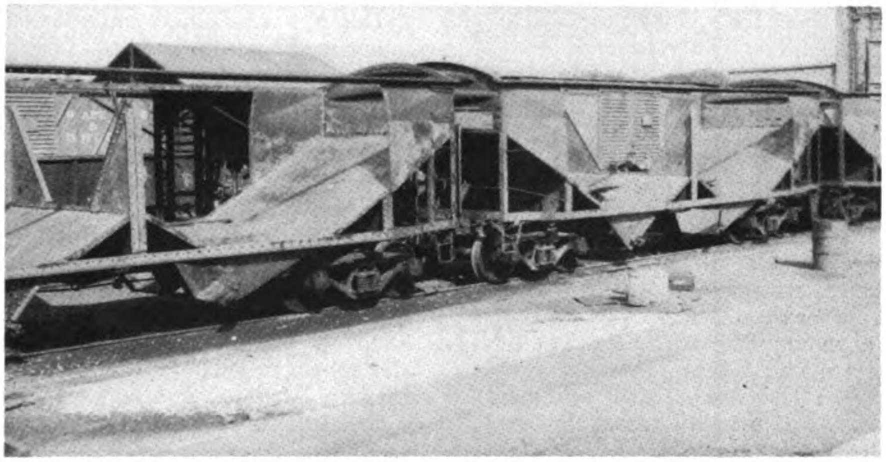
A second aid to maintaining full production irrespective of weather conditions was the use of a canopy placed on top of the bulb angles by a large pneumatic-tired A-frame. This protected the key position of the outside section of the line. The A-frame, wide enough to span the car crossways, was equipped with a traveling hoist which positioned the canopy on the bulb angles for protection of the welders. The frame, of light tubular construction and mounted on four large tires, could be moved back and forth easily by hand.

The key position protected by the canopy was No. 4, the first of two outside welding positions. Here, unlike position No. 9, the second welding position where welding that was not completed could be finished inside, the welding of the center ridge gusset top section had to be done before subsequent operations could be performed





The accuracy of the jig assembly of the new center-ridge gusset top section at the left is shown by how well it fits the lower section (above), making possible the excellent welded joint between the old and new section (below). At the right is a partially completed car at Position 6.



The final 160 ft. of the outdoor production line just before entering the shop is bordered by concrete runways. The cars above are in the hold position, which is also a material assembly position for subsequent operations in the shop building.

as this weld was covered up in a later operation in this position by the floor plates. While the canopy did not provide complete protection from the weather, it did reduce the amount of delay under moderately bad weather conditions and permitted some production to continue at Position 4 under all but the most extreme weather conditions.

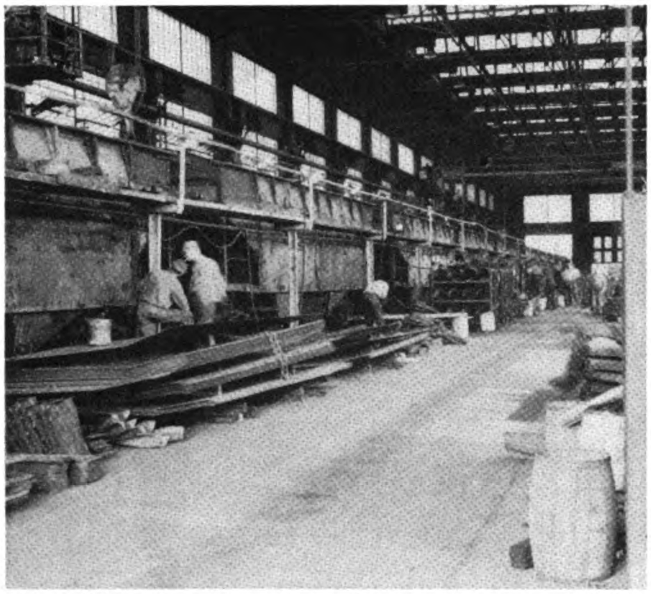
The outdoor section of the production line was 468 ft. in length, and the shop 327 ft., or a total length of 795 ft., excluding the painting facilities at the end of the shop line. A concrete runway 8 ft. wide runs along one side of the tracks at the hold positions for 160 ft.

The line in general was laid out to build up the stripped cars in three basic steps—apply some steel and rivet it; apply more steel and rivet it; and apply remaining steel and rivet it. Miscellaneous operations, such as fabrication of parts and air brake and truck repairs, were performed at convenient locations along the line.

The outdoor production track followed conventional lines with material stacked as close as possible to its point of application. It did, however, have one innovation—two cranes made from scrap center sills placed on one side of the track and used for handling floor sheets, cross-ridge sheets and end patches. The sills from 40-ton box cars were sunk in concrete pillars 8 ft. square by 4 ft. deep. An 8-in. I-beam, 20 ft. long, pinned near the top of each center sill served as the jib for the 1-ton hoist. Two men handled the cranes, one operating each hoist, for applying the parts, holding each part until another man pinned it in place. After pinning up, the crane men helped on the job.

Subassembly of the gussets and hopper doors, and straightening of bent parts were also done outside. Parts straightened included end sills, side sills, corner posts, etc. Most parts were straightened in place on the car. Those that were removed were straightened on a small outside press near the hold position, No. 9. The press was located here to be handy both to the shop and the outdoor production line. The concrete runway along that section of track permitted access by tractor.

The car-shop building is of brick construction with concrete flooring and scaffolding on both sides of the



The scaffolding in the shop runs most of the length of the hopper-car track.

track used for the hopper car work. Two traveling cranes of 15-ton capacity span the width of the building and run the length of the building. They are used to hang side sheets and to pick up the end of a car for truck changes. Movement of the cars within the shop is also done with the cranes. Jib cranes with 20-ft. radii and 2,000-lb. air hoists aid in truck overhaul operations. Any welding which could not be completed on the outside, except the gusset weld, was completed in the shop.

Stripping was done in seven positions on two tracks, six on No. 38 and one on 40. The car was stripped completely down to the underframe with the exception of the ends, bulb angles, corner sheets, corner posts and end posts. The work was done on moves of two cars at a time by 11 burners, 3 carmen and 2 laborers. The operations were divided between the seven positions as follows:

Position 1 (2 burners, 1 carman and 1 laborer). Dropped the four side sheets and cut the side sill angles. Removed the top and bottom floor sheets, the outside and the inside hopper sheets, the crossridge sheets, the crossridge gussets and the longitudinal hood sheets. Trimmed the steel ends. The carman and the laborer removed the scrap and piled it on the four side sheets which had been dropped for later removal by a bulldozer. The carman also removed all rivets from center sills, floor pans and floor braces. Four cars per day were stripped here.

Position 2 was identical with Position 1 as to the number and type of workers assigned and the operations performed. Here, too, four cars per day were stripped, making a total of eight of the ten cars scheduled daily.

Positions 3 and 4 (2 burners). These two positions can be considered as one position containing two cars with a scaffold running the length of the two cars on each side. The two burners assigned to these positions worked on the scaffold, burning the tops of the side sheets loose, the stub posts off, and the top halves of the side and center splice plates. The stub posts and the splice plates were saved for later reapplication. The preceding work was performed on eight cars per day.

Position 5 (2 burners). Burned the doors down and the door closing bars off the doors. Burned the bottom door hinge angles and the cardboard brackets, an average row of rivets from the side sheets, leaving two rivets in each side sheet to hold the side sheets on until removal at Positions 1 and 2. Cut the side posts off from the outside. Burned off the short splice plates at the bolsters and saved them. Burned the bottom half of the side and center splice plates. When the cars were finished, one burner helped the two burners at Positions 3 and 4 complete the eight tops. The remaining burner completed the stripping of the doors, burning the hinges off the hinge angles and removing the hinge pins. Eight cars per day were worked in this position.

Position 6 (1 burner and 2 laborers). Dropped the doors on two cars, burned the door closing bars off the doors, burned the bottom row of rivets from the side sheets, leaving two rivets in each side sheet. Cut the side posts off from the outside, burned off the short splice plates at the bolster and saved them. Burned the bottom half of the side and center splice plates; the burner did this on the last two cars, then helped on the doors. The two laborers picked up and loaded reclaimed material, stub posts, short splice plates, long splice plates, and the doors. This completed 8 cars per day.

Position 7 (2 burners and 1 carman). This was a two-car position on Track 40, the second of the two stripping tracks. The three men here stripped the two cars complete and handled all scrap and reclaimed material. These two cars, plus the eight stripped on the first six positions, furnished the ten stripped cars for the daily rebuilding assignment.

The cars were rebuilt on an assembly line basis in the following 17 positions:

Position 1 (1 carman). The car was cleaned up and generally prepared for the line, knocking off the rust, blowing off the car, painting the center sills, etc. This carman also helped assemble the side sill at Position 2.

Position 2 (1 burner, 1 carman and 1 apprentice). Trimmed off old center pusset sheets for application of new sheets. Applied and fitted up side sills. Removed bent corner posts, end posts, end sills and top end sheets when necessary.

Position 3 (1 carman and 1 apprentice). Applied and fitted up longitudinal hood sheets, inside hopper sheets and floor plate supports. An additional carman alternated between Positions 2, 3 and 4 to help fit up and handle some of the heavy material used in these positions such as side sills, gussets and floor plates.

Position 4 (1 welder, 4 carmen and 2 apprentices). Applied and fitted up bottom floor plates, floor stiffener angles, door closing angles and outside hopper sheets. Reamed all holes. Welded in new center ridge gusset and side sills, and tack welded the card board brackets. Applied hand brake and reamed longitudinal hood sheets. The large A-frame was used in this position to hang the gussets and the hand brakes.

Position 5 (2 riveting crews of 2 carmen and 1 helper each). Riveted bottom floor plates, longitudinal hood sheets, train line brackets, floor angles, transom ends and hand brakes, a total of approximately 220 rivets per car.

Position 6 (1 burner, 3 carmen and 1 apprentice). Applied and fitted up the top floor plates, center ridge sheets, side corner sheet patches, and end sheet patches. Two jib cranes hung steel in this position.

Position 7 (1 burner and 2 carmen). Fitted up and reamed top floor sheets, cross hood sheets, gussets, and door hinges. One additional car held in this position to keep line intact.

Position 8 (two 3-man riveting crews). Riveted top floor plates, center ridge sheets, bottom of the gusset, of 160 rivets per car.

Position 9 (2 welders). Welded in the longitudinal hood sheets and ends, the outside of top floor plates and side bearings. Also tacked the floor plates and cylinder brackets for riveting crews in position No. 8. Held

4 additional cars for shop in this position to maintain full production in event of rain. One laborer outside of shop picked up keys and pins for fitting up crews. This concluded all positions outside of steel car shop.

Position 10 (6 carmen and 1 burner). This was the first position inside the steel car shop. Here steel sides, posts and stub posts are hung and fitted up. The burner burned holes in the end patches and where holes didn't line up. Also applied safety appliances.

Position 11 (5 carmen, 3 apprentices and 2 air men). Reamed rivet holes in steel sides and ends of car. The air men cleaned the air brakes when needed, and did general air repairs, such as changing hoses and angle cocks and testing the car.

Position 12 (3 rivet crew and 1 burner). One rivet crew riveted the ends of cars in Positions 11 and 12, an average of 100 rivets per car. The other two crews riveted the gusset to the side sheet, the floor to the side sheet, and the short splice plates at the bolster of the car, and the hinge butt angles. These crews averaged 140 rivets per car. The burner burned the cotter keys, tie strap rivets and brake hanger pins for the truck-work position and cut out bad rivets in Positions 12 and 13.

Position 13 (4 rivet crews). Each crew riveted one-fourth of car's side sheet rivets, averaging 170 rivets per car per crew.

Position 14 (4 welders, 2 burners, 1 carman, 1 apprentice and 1 painter helper). One welder welded in coupler carrier irons on the facing ends of the cars in positions 13 and 14; a second welded on side corner patches and packing retainers in the truck sides; and two welded inside of the hoppers on the floors. One burner and the carman hung and fitted up doors. One burner and the appentice straightened the ends of the car, posts and grab irons that are bent. The painter helper removed rust and slag from the car.

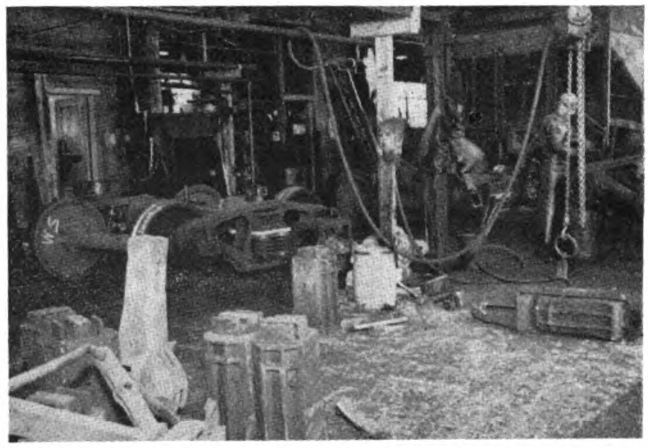
Position 15 (9 carmen, 2 burners and 2 helpers). Five carmen worked on trucks, dismantling, repairing and assembling. Two burners worked couplers and draft gears with one carman who wedged the gear in the yoke and worked with the overhead crane to remove draft gears, yokes and couplers. He also helped on trucks. One carman and one helper worked on truck sides, removed dust guard plugs and dust guards, applied new ones and blowed out journal boxes. The helper also pulled and packed journal boxes. Two carmen and a helper operated as a rivet crew to rivet tie straps, floor rivets, center plates, truck side bearings and getting missed and bad rivets. They averaged 60 rivets per car. The ends of cars in Positions 15 and 16 are raised and placed on horses for working on the trucks.

Position 16 (3 welders). Laid up steel and welded holes around side posts, floor sheets and corners. Also welded coupler shims.

Position 17 (2 painters). Applied first coat of paint after washing with solvent. Sand blasting was not required as all material was either new or had been thoroughly cleaned at previous positions. Position 17 was outside of the shop building.

Following the cleaning and application of the first coat, the car was switched to the paint track for the second coat of paint and stencilling, which was done by five painters and four helpers. Two helpers also oiled and packed journal boxes on this track after painting was completed, using reclaimed waste. The packing at Position 15 was done with the old waste as a temporary measure until all painting was finished.

One inspector and one air man worked the shipping track where they made the final air test and adjusted



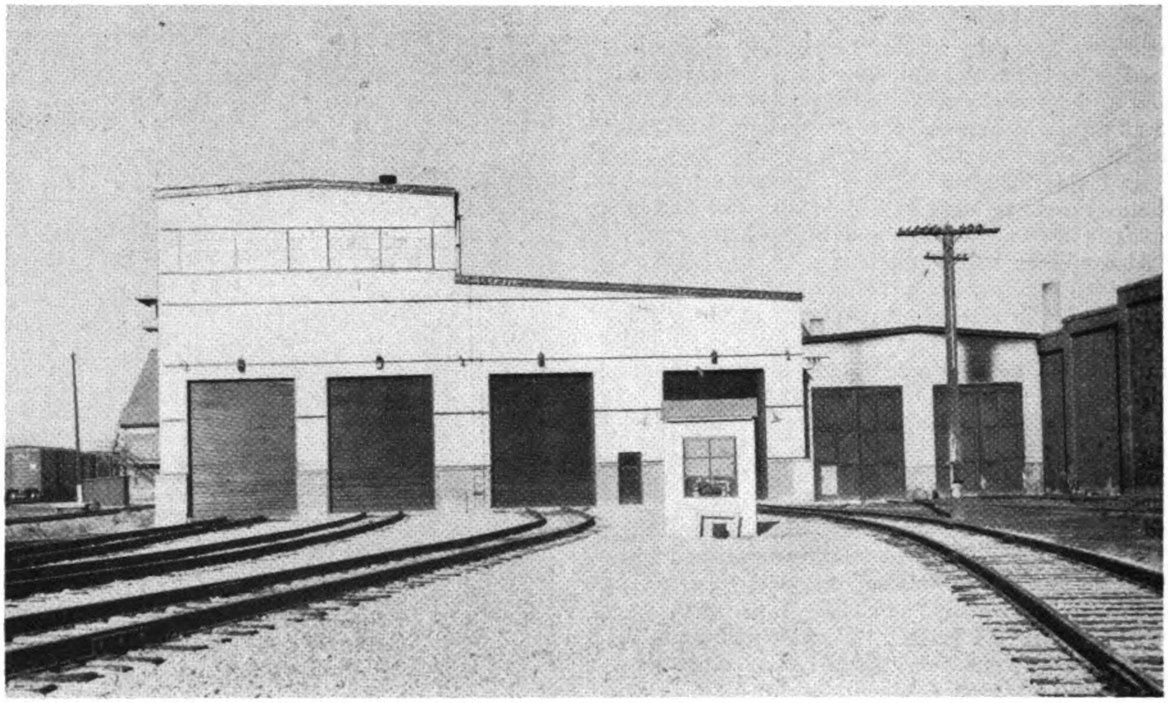
The area for changeout and repair of trucks and draft gears.

The draft gear is transported to the car and lifted into place with this two-wheel combination carrier and jack.

the brakes, and gave the car a final overall inspection.

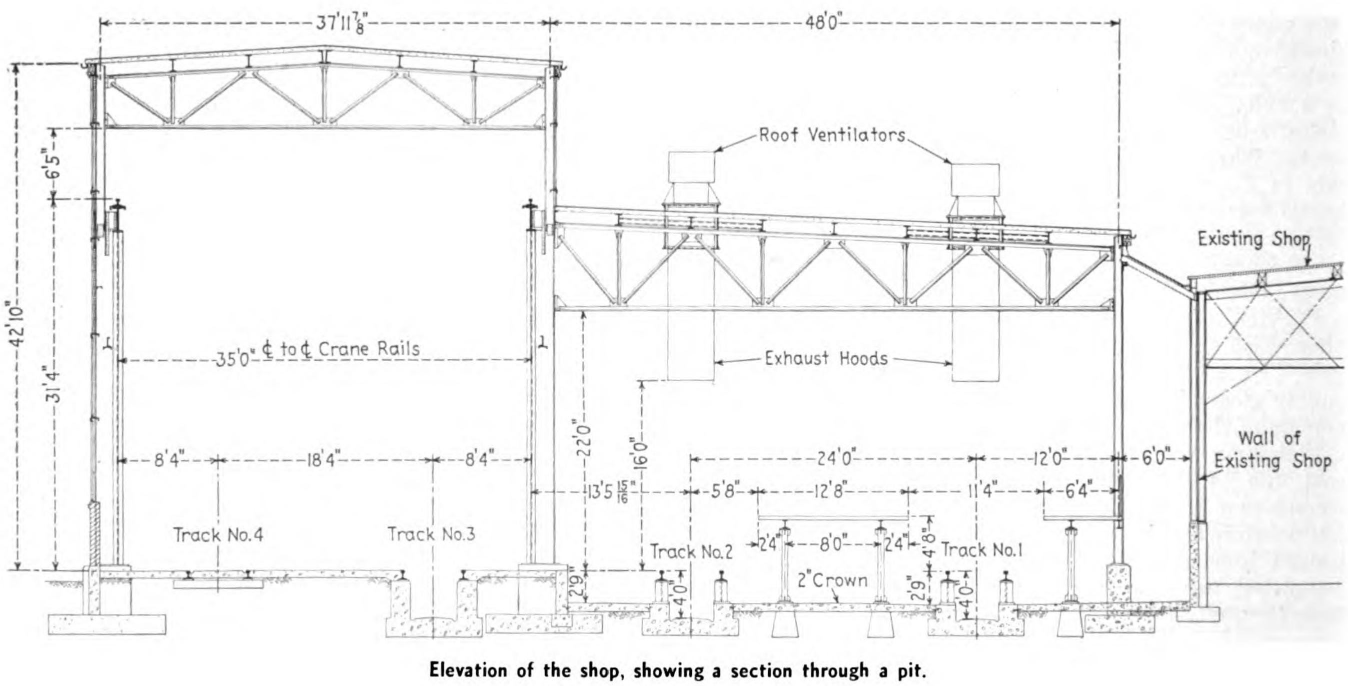
Eighteen men in addition to those employed on the line handled miscellaneous jobs and did subassembly work. There was one general inspector, and there was a helper who supplied oil for forges inside and outside of the shop. One burner and two apprentices tore down, repaired, assembled and tested hand brakes. The crane man operated the overhead crane, handling wheels, trucks and steel sides, and moved the shop line. A 50-ton jack was used between Positions 14 and 15 for straightening steel. An overhead I-beam equipped with a 750-lb. air hoist handled the air jack used in straightening ends.

Two jig crews were also employed. One comprised two carmen and a helper. They riveted hopper doors and worked on the press which straightened door angles and floor plate angles. The second jig crew was composed of one burner, four carmen and four helpers. Two of the helpers carried completed subassemblies from the jigs to the cars at Positions 2, 3 and 4. The remaining two helpers and the four carmen made up two rivet crews who used a gusset jig and a hopper pocket sheet jig to fit up, ream and rivet outside hopper sheets, center ridge gussets, door angle hinges, door locks, longitudinal hood sheet brackets, and floor plate supports, an average of 150 rivets per car set. The men at this position also cleaned up door locks and hinges.

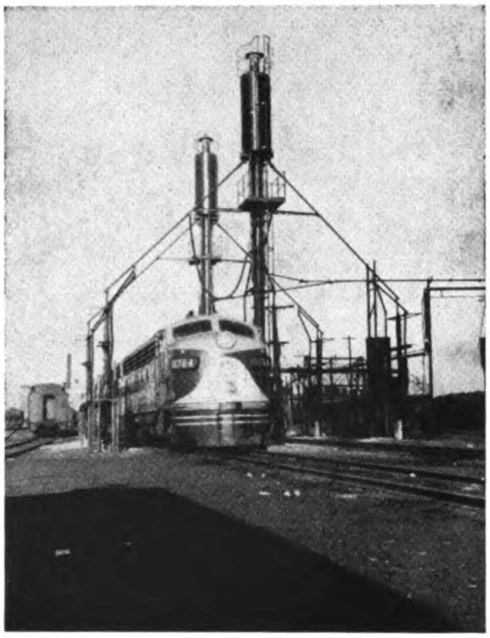


The small building in the foreground houses the equipment for delivering make-up lube oil.

Wabash Diesel Shop at Moberly



Elevation of the shop, showing a section through a pit.



The locomotive at the fueling station (left) is typical of the clean appearance of all Moberly-maintained units. The sanding facilities (right) serve the two entrance tracks and can sand three units simultaneously.

THE Wabash has built a new diesel shop at Moberly, Mo., which is modern and efficient in every respect. At the same time construction costs were held to a minimum by utilizing space and two of the walls of the existing L-shaped steam back shop at that location. The diesel servicing and repair area consists partially of an extension built on to one corner of the steam shop and partially of an area taken over from the steam shop. The latter, 45 ft. by 80 ft., houses a cleaning room, a parts reconditioning room, a storeroom, a tool room and an office.

The new section of the shop, that is the portion exclusive of the above-mentioned steam shop area converted to diesel work, has a floor area 198 ft. 10 in. by 86 ft. It has four tracks. One is for switching locomotives and heavy repairs, a second for truck work only. The remaining two tracks have locomotive floor level platforms for servicing road units.

The heavy repair track and the truck repair tracks are served by an overhead traveling crane with a 35-ft. span. a maximum capacity of 25 tons, and a 5-ton auxiliary hoist. The heavy repair track extends into the steam shop where wheel boring is done on an existing Bullard vertical turret lathe. A high level platform 21 ft. long and a little over 13 ft. above the floor is installed along the wall edge of this track at the approximate center of the inside length for access to locomotive roofs.

The truck repair track, like the heavy repair track, is a floor level track, and has a pit 28 ft. long and just under 4 ft. deep. Trucks are handled between this track and the center servicing track through a Whiting consolidated drop pit with a 23 ft. 10 in. inside clearance. An air hoist is also installed between these two tracks for use as a winch in moving trucks. Movements can be made in either direction at any point along the truck repa'r track by means of this winch and a fixed sheave at each end of the track.

Some truck work is at present being handled in the steam shop adjacent to the office and storeroom, but eventually will be handled within the diesel shop prop r. This includes steam cleaning and rebuilding of trucks, and cleaning and servicing of traction motors. For turning trucks undergoing overhaul in this area, the Wabash built an extremely simple arrangement. A standard 25-ton air jack is placed in a pit approximately 3 ft. square, and a ball-bearing plate placed on top of the jack shaft. To turn the truck, it is run over the pit, and the jack is raised to contact the spring plank at a point where the truck will be in balance when l:fted. Raising the jack a few more inches clears the truck wheels from the track, and allows the truck to be turned easily by hand.

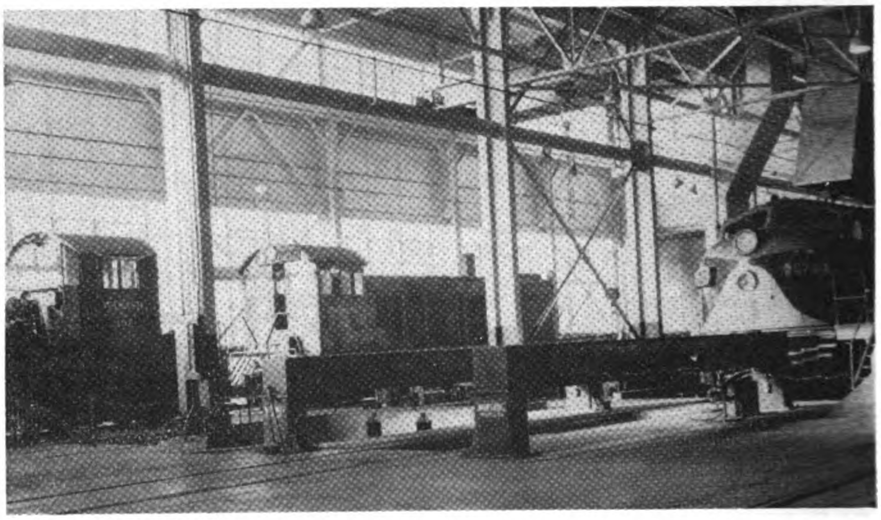
The two servicing tracks have elevated platforms for access to the locomotive body interior, and these platforms are of cantilever design to minimize interference with truck and other underneath work. The rails are mounted on H-beam sections for better lighting within the pit and for easier handl'ng of material between the pit and the outside. The inspection pit between the rails is 15 inches below the depressed floor on the outside of the rails. This feature permits a man to walk upr ght, or nearly upright, under the locomotive when it is over this pit. Lighting for underneath work is furnished by fixtures with two 40-watt lamps spaced at 8-ft. centers on the underneath side of the rail edge of each platform.

Each of the platforms is 108 ft. long, or long enough to accommodate two freight units or one passenger unit. This length is adequate as all freight locomotives maintained at Moberly comprise only two units, while all but one of the passenger runs are handled by single units.

Eight Exhaust Ducts

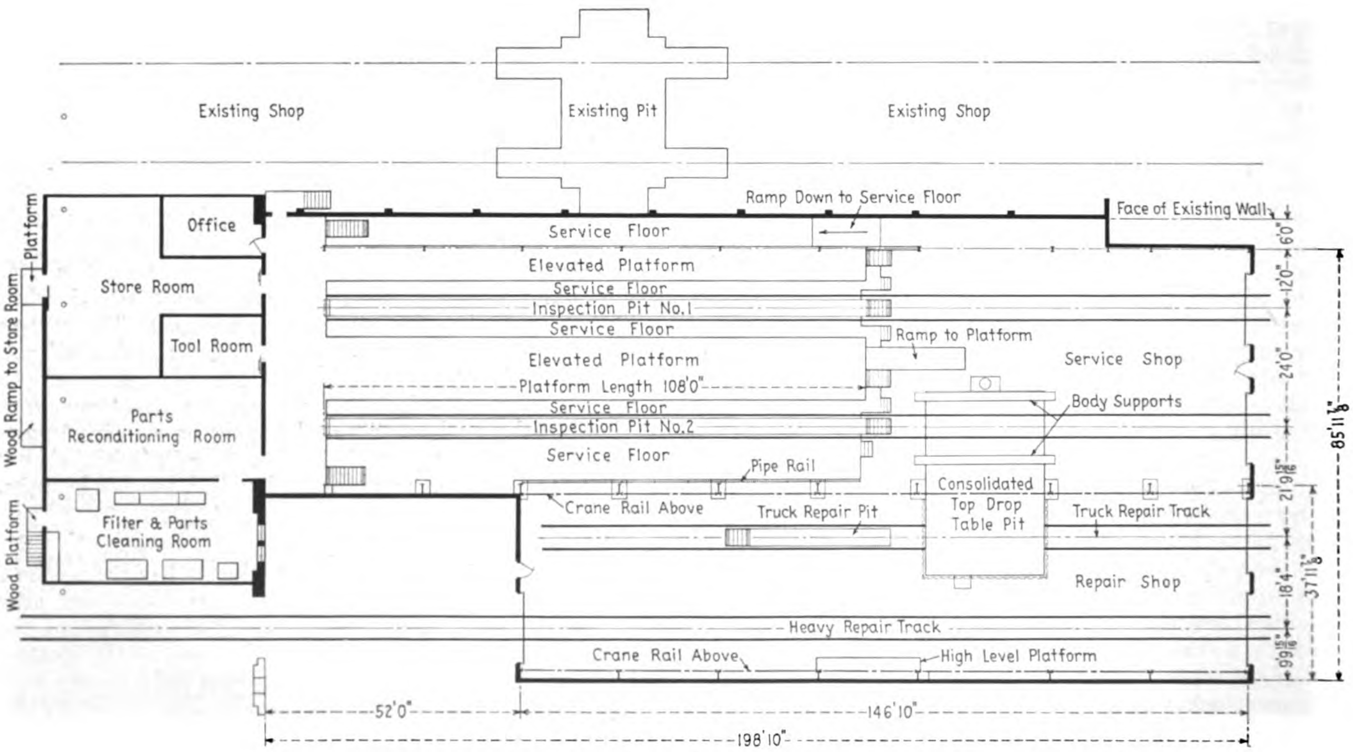
The heating and ventilating problems has been solved for this shop by installing eight exhaust ducts, four over each of the servicing tracks, to catch the exhaust of the engines regardless of where the locomotive is spotted. Each of the exhaust ducts has its own individually controlled fan and has shutters which close automatically when the fan is not running to prevent gravity loss of warm air. The arrangement has been found satisfactory

The eight individually controlled forced-exhaust ducts as seen from the center elevated platform.

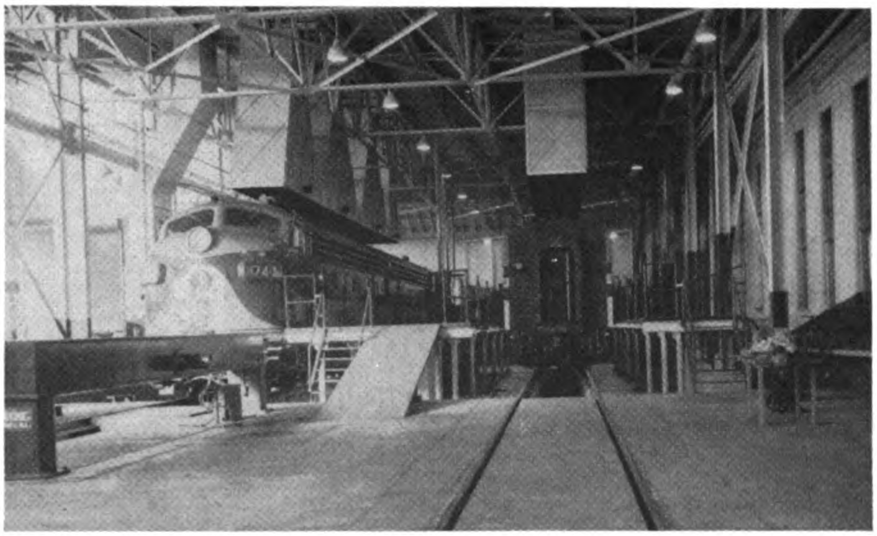


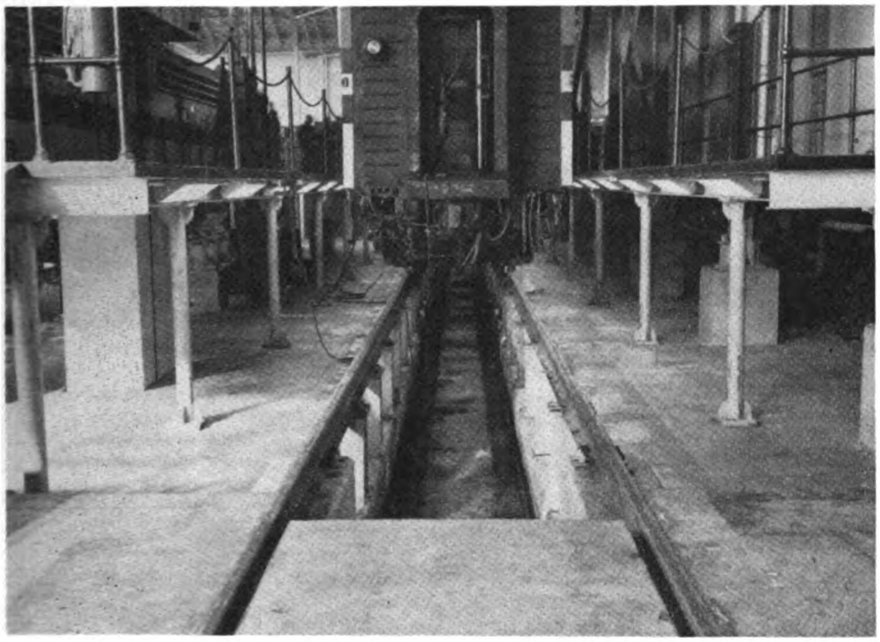
The drop table which serves the two center tracks has an inside clearance of 23 ft. 10 in.

Layout of the new Wabash diesel shop at Moberly



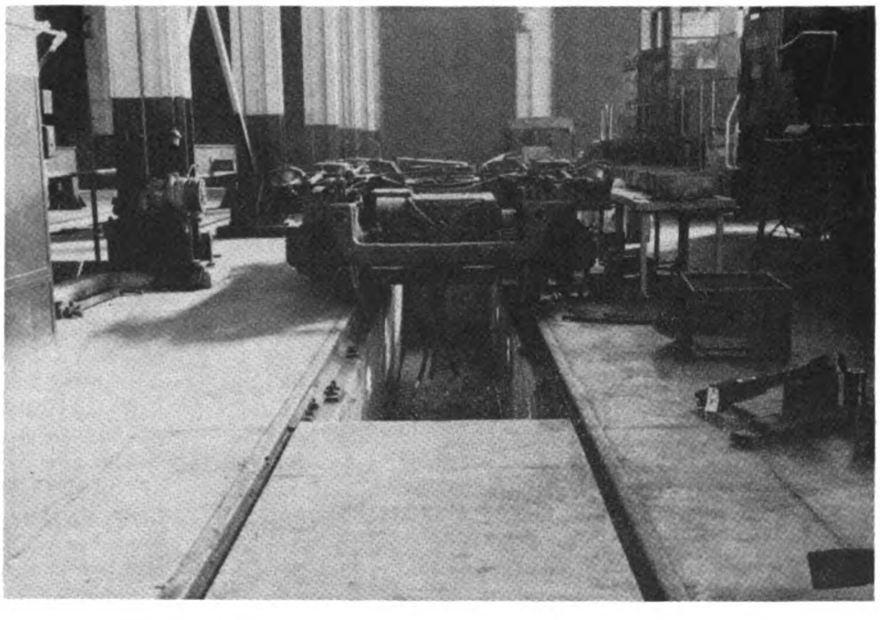
Interior of the servicing portion of the house.





The pit floor, 15 in. lower than the depressed floor outside the rails, gives a total pit depth of 4 ft. below the top of the rails and permits a man to walk upright, or nearly upright, under the locomotive.

The repair pit on the truck track.



in keeping the shop free from objectionable gases, and the heating requirements have not been considered severe. The ducts are mounted with the lower edges 16 ft. above the top of the rail, thereby fitting fairly close over the exhaust stack. This close fitting, plus the fact that only one duct need be in operation for each engine stack, accounts for the adequate dissipation of the exhaust fumes without expelling an excessive amount of warm air from the shop interior.

The tool room, parts reconditioning room, storeroom, and the filter and parts cleaning room as well as the office are located at the same level as the elevated platform. Such an arrangement eliminates having to carry parts or material up and down ramps, except to the truck and heavy repair track.

The cleaning room and the parts reconditioning room are each 20 ft. by 42½ ft. Both are served by a traveling crane with a ½-ton electric hoist and both are illuminated by overhead fluorescent lighting. The cleaning room is equipped with a Magnus Aja-Dip cleaning and rinsing arrangement, a Farr filter washer and oiler, and a shop-made oven. The two Aja-Dip machines, containing a volatile compound, have forced exhaust to the atmosphere. The room also contains a steel cabinet to hold parts for cleaning with a steam hose.

Flat filters are stored in a cabinet in one corner of the room, cylindrical filters in a drum in a second corner. The drum holds Michiana filters along the outside circumference and sintered bronze fuel filters in a rack mounted on the vertical support of the drum. The rack for the latter is simply a circular plate with holes bored out near the outside circumference to hold the bronze filters. Both the rack and the drum can be revolved easily to get at any of the filters in storage.

The parts reconditioning room contains a valve grinding machine, a honing stand, a head stand, a small dry grinder, cylinder head and liner testing equipment, speed recorder testing machine, face plate, gauges and indicators for checking pistons, connecting rods, piston carriers, etc., air and steam gauge testing equipment, steam generator stack switch and high temperature test equipment. The benches have slotted edges for working piston and rod assemblies.

The storeroom, office and tool room combined occupy an area 34½ ft. by 42½ ft. The storeroom covers this entire space except for two sections 12 ft. by 20 ft. in two of the corners. These two sections are devoted to the tool room and the office.

Working efficiency within the shop is kept high by issuing to each mechanic a tool box which he checks out of the tool room in the morning and checks in again at night before leaving. The tools vary slightly from one box to the other depending on the job to which the workman is assigned. In each box, however, is a group of tools which, based on experience, represents the best compromise between carrying around a lot of unnecessary tools and carrying so few that the mechanic is continuously running to and from the tool room. A list of tools in a typical box is shown in Table 1.

TABLE 1—LIST OF TOOLS IN INDIVIDUALLY ASSIGNED TOOL BOX

Screw driver
½-in. ratchet
5-in. extension for the ratchet wrench
10-in. extension for the ratchet wrench
8-in. crescent wrench
Prick punch
Injector timing gage
½-in. universal joint
Hammer
Chisel
Pliers
Injector pry bar
½-in. nut spinner
7-in. Extension for a ¾-in. drive wrench
Set of box wrenches from ½ in. to 1⅜ in.
Set of open end wrenches from 5/16 in. to 1¼ in.
Set of sockets with ½ in. drive from 7/16 in. to 1⅛ in.
Set of sockets with ¾ in. drive from ⅞ in. to 1 1/16 in.

Outdoor facilities include a sanding tower, fueling station and a lubricating oil makeup station in that order proceeding into the shop. The sanding facilities and the fueling facilities both serve two tracks and can handle three units simultaneously. This is necessary even though none of the Moberly maintained locomotives operate in three units because three-unit freight locomotives in other maintenance pools do operate through and require servicing at Moberly.

The makeup oil station comprises a small steel structure equipped with a hose on a reel located between the two entrance tracks to the servicing portion of the shop. When the amount of makeup lubricating oil to be added has been determined, the oil is delivered under pressure to the locomotive through this hose. Control of the delivery is by a remote control switch in the add-oil house which turns a pump on and off in the lubricating oil storage room in the back shop. The desired brand is selected by setting the right valves in the make-up house, and the amount delivered is indicated by a meter.

As a safety feature to prevent damage to locomotives or to the shop building, "stop-and-go" type lights are mounted above the four entrance doors to the house. When a door is closed or only partially open the light above it is red. When the door has been opened sufficiently to clear the largest diesel unit used on the Wabash the light turns to green, indicating to the hostler that it is now safe to bring the locomotive through the door.

Motive Power Maintained

The following units receive major maintenance work at Moberly:

Nine passenger units, including two GP-7 road switchers equipped with heating boilers and used in passenger service.

Twenty-two road freight units, including two GP-7's used in local service.

Twenty-three switching locomotives.

The Moberly shop also gives en route servicing to a minimum of 24 units each day in the form of eight three-unit locomotives which operate in through time freight service between Decatur, Ill., and Kansas City.

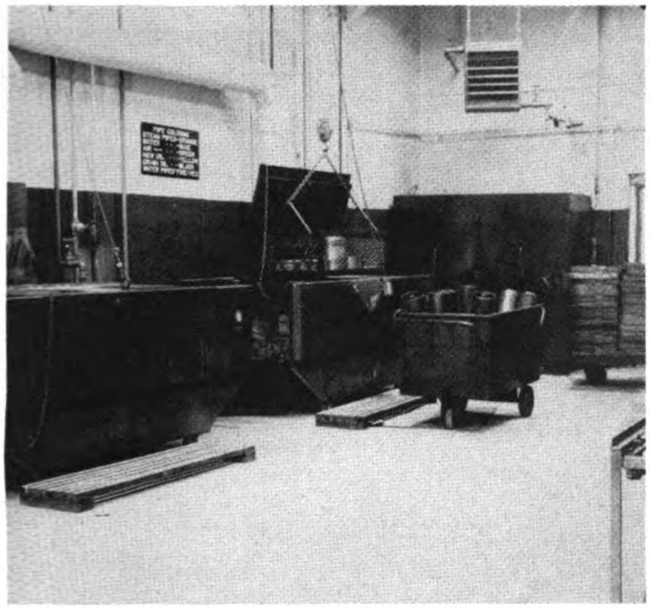
All freight and seven of the nine passenger units maintained at Moberly operate in general freight and passenger pools with no locomotive assigned to any specific train. The remaining two passenger units comprise the regularly assigned locomotive for the streamliner "City of St. Louis."

The units maintained at Moberly are given all periodic inspection and all heavy work that becomes necessary between scheduled repairs. Scheduled heavy repairs to all Wabash power are made at the Decatur diesel back shop at the following intervals:

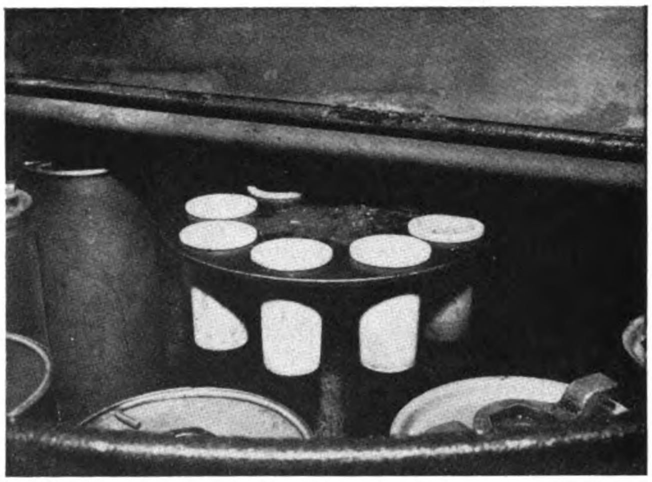
170,000 miles for switching locomotives.
400,000 miles for freight units.
750,000 miles for passenger locomotives.

The above mileage schedules are flexible. If a unit in any of the three types of service is at or near its mileage limit but has the engine in good shape, the wheels at proper contour, the traction motors recently gone over, etc., the period would likely be extended.

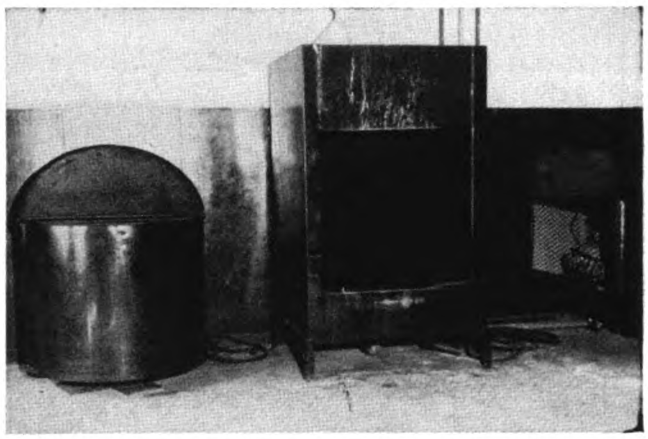
Of the 23 switching units assigned to Moberly for maintenance, only three are stationed there. The remain-



The cleaning room. The filter cleaner is in the right foreground and the cleaning tanks at the left.



The interior of the filter storage drum



The steam cleaning and rinsing booth on the right and the storage drum for Michiana filters and sintered bronze filters on the left.

ing 20 work at various scattered points in the district. Those switchers stationed outside of Moberly receive all periodic inspection at the points where they are stationed. If heavy work becomes necessary between the general repairs made at Decatur, the switcher is brought to Moberly for the particular job to be done and is at that time also given such other repairs as are considered necessary to keep it on the job at its working point for an extended period of time.

For example, if a switcher that is stationed at Omaha requires a new set of wheels, the unit is brought to Moberly for the new wheel set and while there the engine is gone over, the traction motors touched up, the auxiliaries checked, etc.

While Moberly does not handle scheduled heavy repairs, it does do extensive work when such work becomes necessary between the scheduled back shoppings. In one recent case, a Kansas City switcher received all new liners, pistons, rings, exhaust manifold and turbo-charger, and the heads were reconditioned.

In general engine work is done complete as is body and truck work. Electrical work is handled up to dipping and painting. Some commutators are turned on small motors up to the approximate size of auxiliary generators. Traction motor and main generator commutators are stoned only.

Wheel work is done complete. Individual wheels are bored in a section of the steam shop adjacent to the extension of the diesel shop heavy repair track. Mounted wheel sets are turned in the car shop. The latter are handled in the car shop because a new and modern machine has been installed there. To make economical the handling of the wheels to and from the car shop a concrete ramp has been laid down between the locomotive and the car shop. The wheel sets are carried back and forth between the two buildings on a fork lift truck. The truck is also equipped with a horn for handling unmounted wheels.

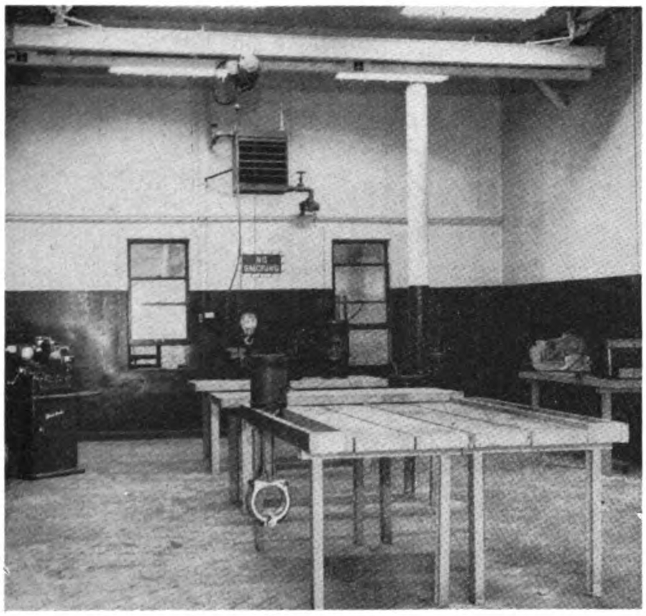
Lubricating oil changes are made principally on the basis of chemical analysis, usually on the fire and flash and the dilution tests. The railroad also sets a limit at which the oil must be changed regardless of condition; this limit is 30,000 miles for freight units, 50,000 for passenger, and 6 months for switching locomotives.

When an oil change is made the fact is recorded on a card which shows the date of the change and the brand of oil in the engine, and this card is displayed in the cab of the locomotive. The use of such cards has eliminated lengthy searches in the locomotive log book to determine the brand of oil that is already in the engine when makeup oil is needed.

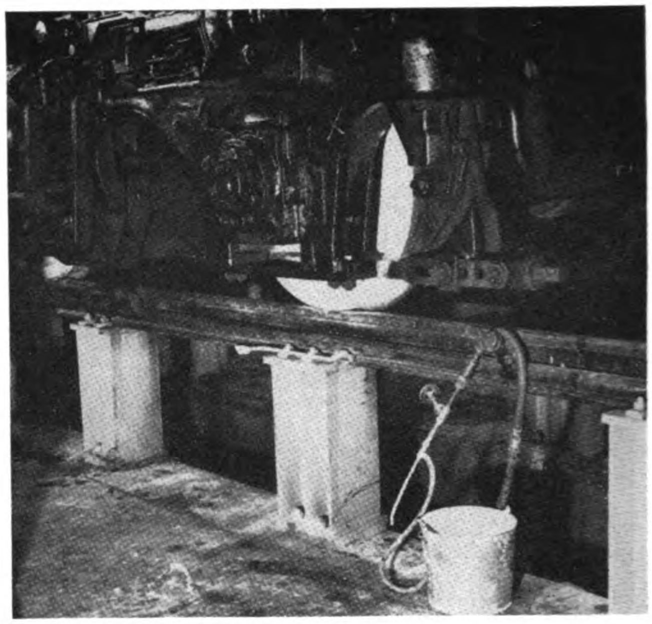
Cleaning Emphasized

One of the strongest impressions a visitor to Moberly receives is the unusually clean appearance of all units maintained at this point. A thorough cleaning job is done on all passenger units and all freight units at each 5,000-mile inspection and whenever the unit is brought in for periodic inspection. Switching locomotives are cleaned thoroughly each month.

All cleaning is done by hand with a handle brush, using Oakite No. 70 and water for the body and Oakite No. 8 and distillate for the trucks and underneath parts. On the car body the procedure is to spray the solution over the entire surface with air pressure, followed by a man with a long handled brush to agitate the solution on the surface. He is in turn followed by a third man who gives the body the clear water rinse.



The parts repair room before it was completely equipped.



Passenger locomotive wheels are thoroughly cleaned and whitewashed every 5,000 miles to facilitate inspection for cracks. At the lower right is the equipment for spraying on the whitewash.

The flat blade on the bottom of this scraper is used for scraping most of a wheel; the curved blade, for the radius between the rim and the plate. The use of the scraper avoids moving the locomotive for scraping or to pinch the wheel around.

Trucks are cleaned by spraying from a tank under pressure over the entire truck surface, as well as the tops of traction motors, tops of fuel tanks, air reservoirs, brake cylinders and other underneath parts. The sprayed on solution is allowed to set for 10 minutes, after which it is washed off with hot water hose containing hot water under high pressure. During the cleaning and rinsing operations on the trucks, the engine and the traction motor blowers are left running to keep water out of the traction motors.

The interior is sprayed with a fine mist of Oakite No. 8 plus distillate to cover the entire interior, including the engine, passageways, floors and roof. This is washed down with clear hot water. The excess water on the floor is then blown toward drain holes with an air hose. After the excess water has been flushed out through the drainage hole, the floor is mopped dry.

One of the secrets of good truck washing is considered by the Wabash to be the use of extremely hot water and the 150-lb. pressure used in the rinse. With the high velocity that results from this high pressure the dirt and grease loosened up by the cleaning solution is completely knocked off.

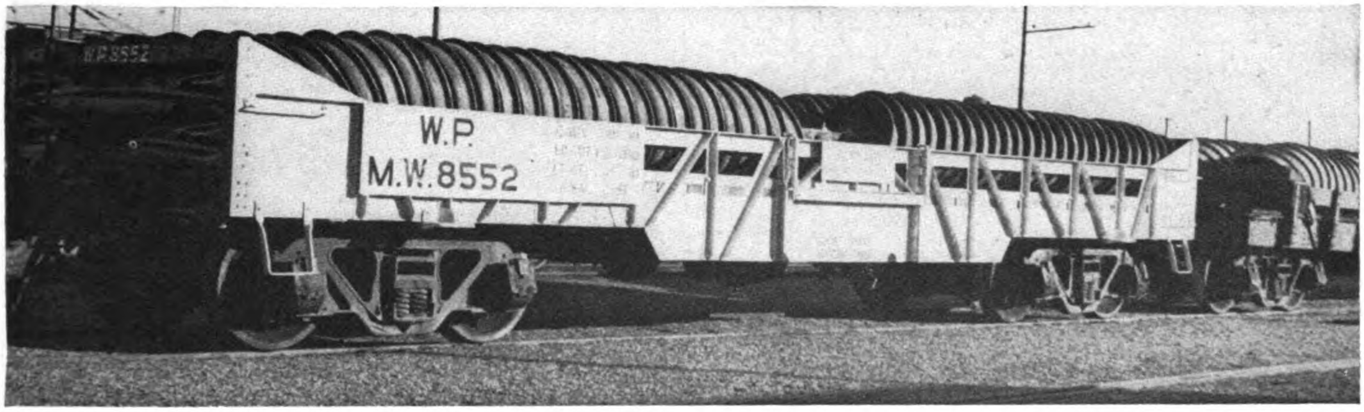
Trucks are washed outside regardless of weather. The car body is washed outside in nice weather and inside in bad weather. The inside washing is done in a stall in the adjoining steam roundhouse. This stall had been lengthened to 140 ft. for the large-tender steam locomotive the Wabash operates, and is therefore adequate to handle 2-unit freight or passenger diesel locomotives.

Close Attention to Wheel Inspection

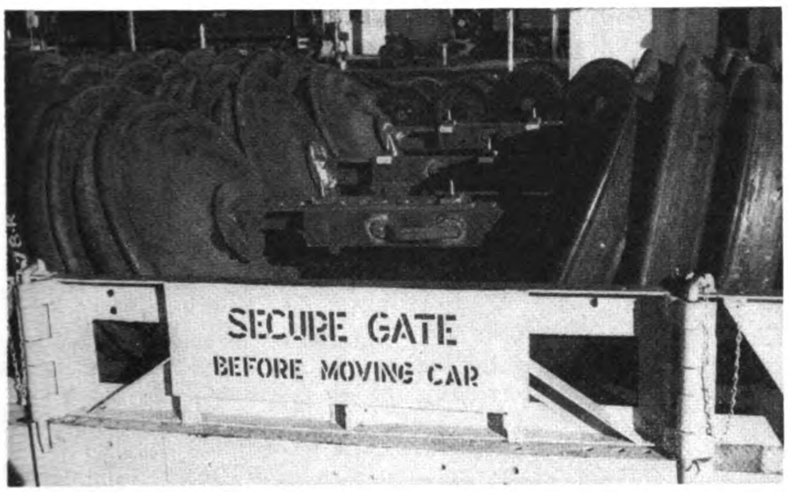
The Wabash follows a strict policy of keeping passenger, freight and switching locomotive wheels scrupulously clean to facilitate inspection for wheel cracks. On passenger units this policy is carried one step further with all wheels whitewashed every 5,000 miles.

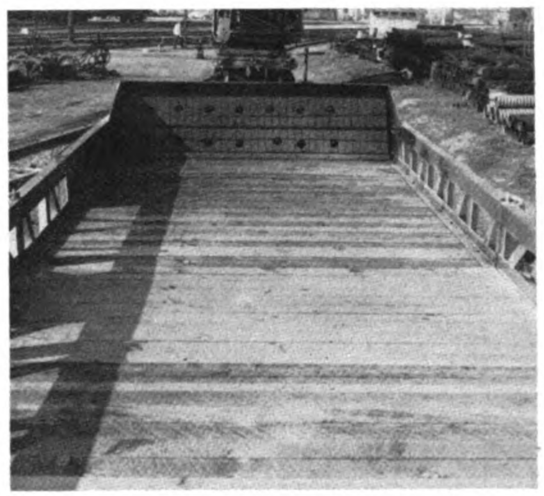
Each wheel is first thoroughly cleaned and scraped with a special scraper. This scraper has a flat blade on one end for cleaning most of the wheel. The other end has a curved blade to scrape the radius between the plate and the rim. The scraper is so shaped and is long enough that any part of the wheel can be scraped in place without moving the locomotive or pinching the wheel around. After scraping to remove the worst dirt and grease, an evaporating solution is sprayed on to prepare the wheel for the whitewash. After the cleaning solution has evaporated the whitewash is sprayed on and allowed to dry, at which time the cracks are readily detectable.

Both the cleaning solution and the whitewash are sprayed on the wheel through a syphon arrangement with a long nozzle, using the house air supply to pick up the fluid. The use of the long section of tubing for the spray nozzle avoids, as does the long scraper, having to move the locomotive or pinch the wheel around to get at the entire wheel surface.



Western Pacific Wheel Cars





Left—How the wheels are braced at the center. The gate may be opened at either side. Right—The permanent blocking at the car end is wood.

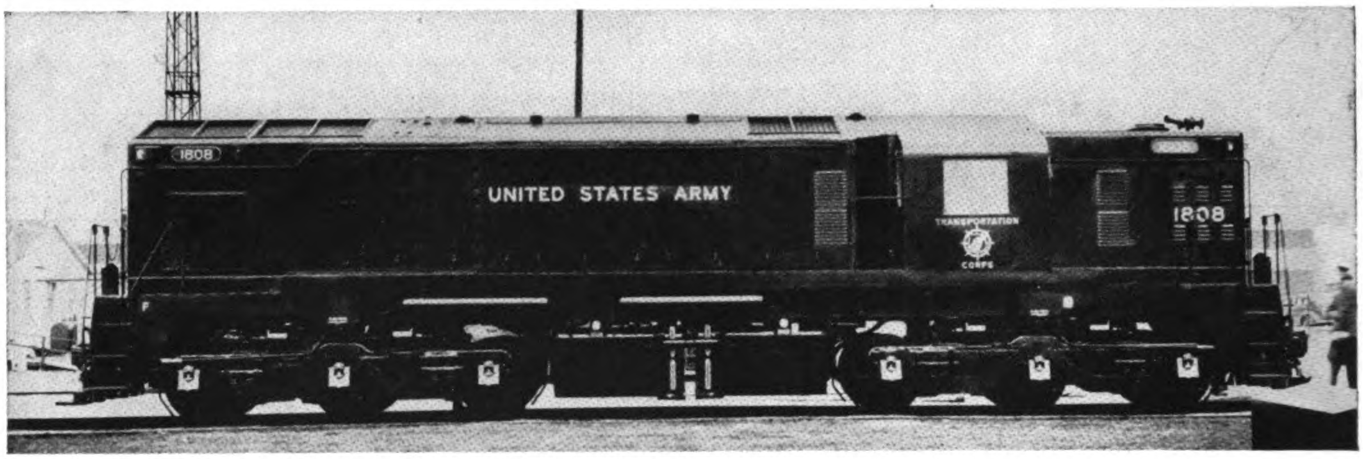
THE Western Pacific has fitted up at the company shops, Sacramento, Calif., four cars designed especially for handling unmounted car wheels between the Sacramento shops and the Griffin Wheel Company's plant at Salt Lake City, Utah. These cars were reconstructed from a series of 36-ft. steel-underframe stock cars recently retired. All of the material, except the steel ends, which were reclaimed from scrap box cars, was obtained from parts of the stock cars. The underframes and draft rigging were strengthened and side sills reinforced with 9-in. channels at the center of the car.

Fifty-ton cast-steel side-frame trucks from retired gondola cars were used, thereby making them suitable for carrying 50-ton loads. A normal full load for these cars, as now being used, is 156 wheels.

The wheels are loaded in three rows from each end toward the center where they are kept in place by spreaders made of scrap angles with an inclined circular plate and plug at each end to fit in the wheel bores. These are adjustable for length by the insertion of pins in positioning holes.

Western Pacific experience in handling loose car wheels by this method has been satisfactory, loads being delivered in good condition without any displacement of wheels at the car center, or rows of wheels being tipped over as frequently happened with former types of loading.

An accompanying view of the unloaded car shows how inclined permanent wood blocking is installed at each end to keep wheels standing at a certain slope and to absorb end shocks. Once the car is loaded, the adjustable metal struts or spreaders are put in place, using the convenient metal hand holds shown, and expanded as much as possible to hold the wheels in place during road movement. The side gate arrangement includes removable hinge pins located at each end so that the gate may be swung in either direction or removed entirely by lifting both hinge pins. These pins have keepers fastened to the top side plate and also have cotter keys at the lower end.



The MRS-1, versatile 1,600-hp. diesel-electric road-switcher, built to Army specifications by the Electro-Motive Division of General Motors Corporation.

E. M. D. Develops Diesel Locomotive for Army

All-purpose unit has standard domestic locomotive wearing parts. Controls and electrical equipment simplified

A NEW type of diesel locomotive known as the Military Road Switcher I, capable of being operated on nearly any track except narrow gage, has been developed upon specifications of the United States Army Transportation Corps by the Electro-Motive Division of General Motors at its La Grange, Ill., plant. The first of thirteen of the MRS-1 was delivered to the Army about the middle of April. The locomotive was designed, developed and manufactured at the La Grange plant and is being service tested on middle western railroads.

The locomotive is so designed that it can be successfully operated in temperatures ranging from 40 deg. F. below to 125 deg. F. above zero. By simple mechanical adjustments its wheels can be moved on the axles so that the locomotive can be operated on tracks ranging from the standard American width on up to the widest encountered on railroads anywhere. Its draft gear is such that it can be quickly fitted with couplers running the gamut of the types used and can be placed in pockets at two heights—34½ in. and 41 in. above the rail. The locomotive can be regularly operated on fuel oil of as low a grade as 40 cetane and in emergencies can be operated on an even lower grade. It is designed for multiple operation with other locomotives of similar characteristics, irrespective of builder, which the Army Transportation Corps now has or has on order.

In announcing the delivery of the first locomotive, Nelson C. Dezendorf, vice-president of General Motors and general manager of Electro-Motive Division, said that "despite its wide range of performance characteristics, the locomotive is made up of standard domestic diesel locomotive wearing parts and assemblies. Thus we were able to shorten the development of the locomotive by years and to make it possible to go into production without plant conversion if we get into a major emergency. So many of the locomotive's major components are standard that Electro-Motive could start producing it without any major delays for changing facilities. At the end of the emergency we could go back to the production of locomotives for domestic use with small delay and no expensive conversion. If we send a lot of these locomotives overseas, there will be no problem on replacements of wearing parts."

The new locomotive is 57½ ft. long, 13 ft. 6 in. high from rail and 9 ft. 8 in. wide over grab rails. Its engine

PRINCIPAL DIMENSIONS AND WEIGHTS OF THE MRS-1 DIESEL LOCOMOTIVE

Overall length between coupler pulling faces, ft.-in.	57-5
Width over grab irons, ft.-in.	9-8
Maximum height above rail, ft.-in	13-6
Distance between bolster centers, ft.-in.	31-0
Truck rigid wheel base, ft.-in.	13-2
Boiler water capacity, gal.	800
Fuel oil capacity, gal.	800*
Sand capacity, cu.ft.	18
Lubricating oil capacity, gal.	200
Engine cooling water, gal.	210
Total loaded weight on rails, with boiler,, lb.	246,000
Axle load, lb.	41,000
Maximum speed, m.p.h.	77
Gear ratio	60:17
Wheel diameter, in.	40

* If boiler is eliminated, fuel capacity is doubled.

is rated at 1,600 hp. for propulsion purposes. Its top speed is 77 m.p.h. Intended for any class of operation—switcher, passenger, or freight—it has been designed to achieve the same results as would be obtained from standard U.S. freight or road switcher units, within the track load limits of European practice.

The locomotive has fully flexible, equalized trucks, with special provisions for high-speed operation. The trucks have three axles, each axle powered with an Electro-Motive D-27 traction motor. All conversion equipment for adapting the locomotive to various track gages has been built into the trucks. The conversion is executed by a rearrangement of parts.

Controls have been simplified to enable enginemen with any previous experience with steam, electric, or diesel motive power, to operate the locomotive without danger of damage to foreign light-weight rolling stock in spite of the unusually high tractive force the locomotive will develop. Main-line contactors have been eliminated and other electrical equipment has been simplified in the interest of minimum maintenance.

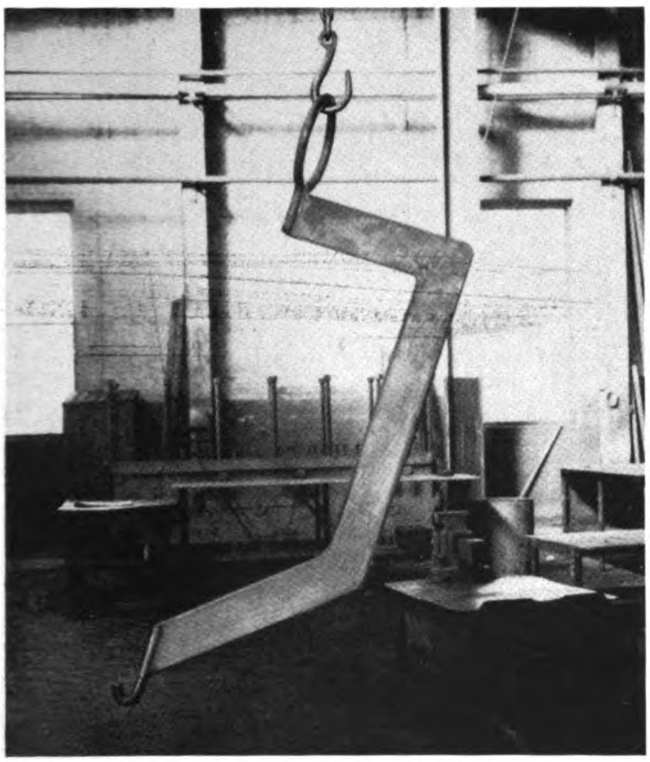
Total weight of the MRS-1 is about the same as standard locomotives of the same horsepower rating, but the distribution of weight over six axles instead of four improves adhesion. Dependable adhesion on good dry rail at full horsepower is 23 per cent, while starting tractive force on good dry rail is 30 per cent.

The MRS-1 is equipped with 6BL air brakes, with provision for vacuum brakes, and the brakes are single rather than clasp type. Journal boxes are friction (solid bearing) type.

The locomotive is powered with a General Motors 16-567B diesel engine, with horsepower input to generator rated at 1,600. The D-12 generator is the same as that used on all General Motors freight locomotives, with a D-14 alternator.

The electrical circuit has two motors in series, with three groups in parallel. There are no shunt steps—the operator having a choice of either full shunt or no shunt. Transition is made at approximately 30 m.p.h.

The principal dimensions and weights of the locomotive are set forth in the table.



Lifter for raising G.M. switcher heads clear of the studs

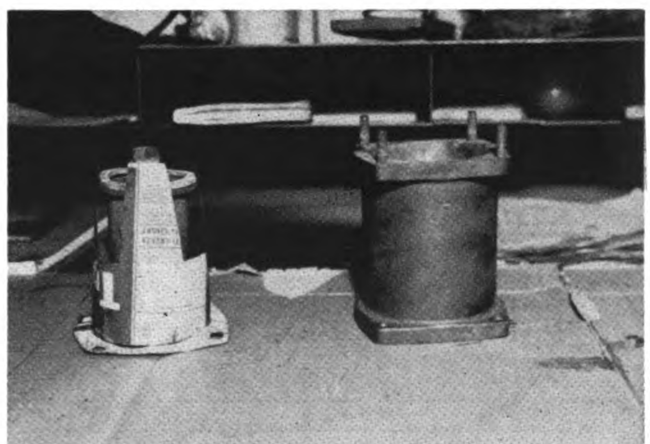
Hook Simplifies Switcher Head Lifting

The illustration shows a fabricated hook to lift the engine heads of General Motors switchers clear of the studs. The hook, made of 1 in. by 4 in. stock, is shaped to fit around the hood to permit lifting the heads straight up. While suspended from the hook of the overhead crane, the head lifter is light enough to be easily worked around the hood as it is lowered into position for lifting the head.

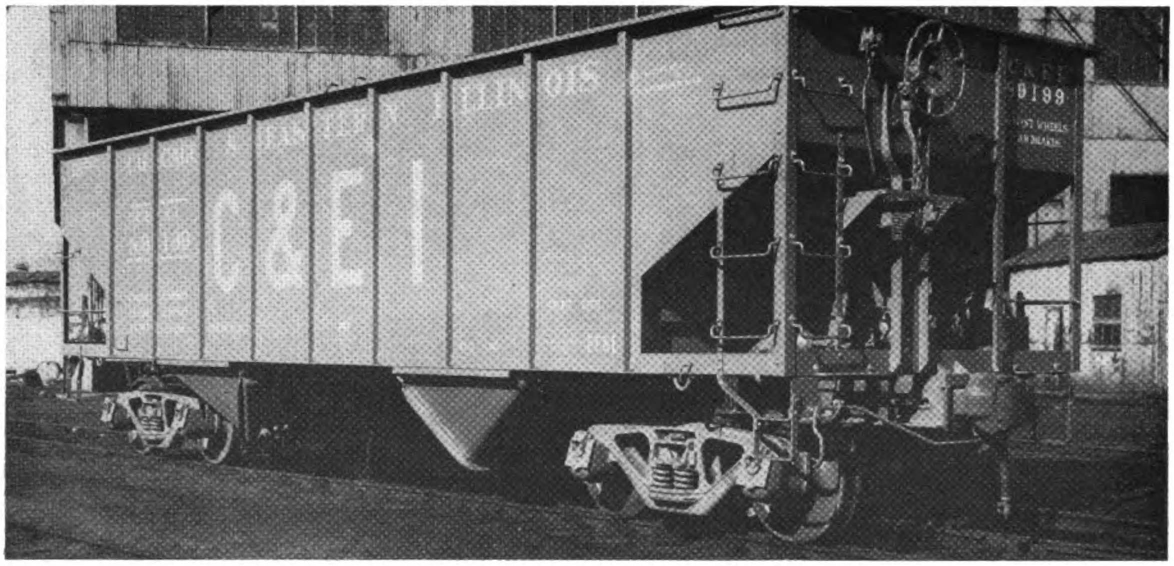
Prevents Breaking Sintered Bronze Filters

The Peoria & Pekin Union has devised a simple and effective method for preventing breakage of Electro-Motive sintered bronze fuel oil filters or crimping of the gaskets. It consists only of an old quart container for oil or anti-freeze cut and shaped to guide the filter into place.

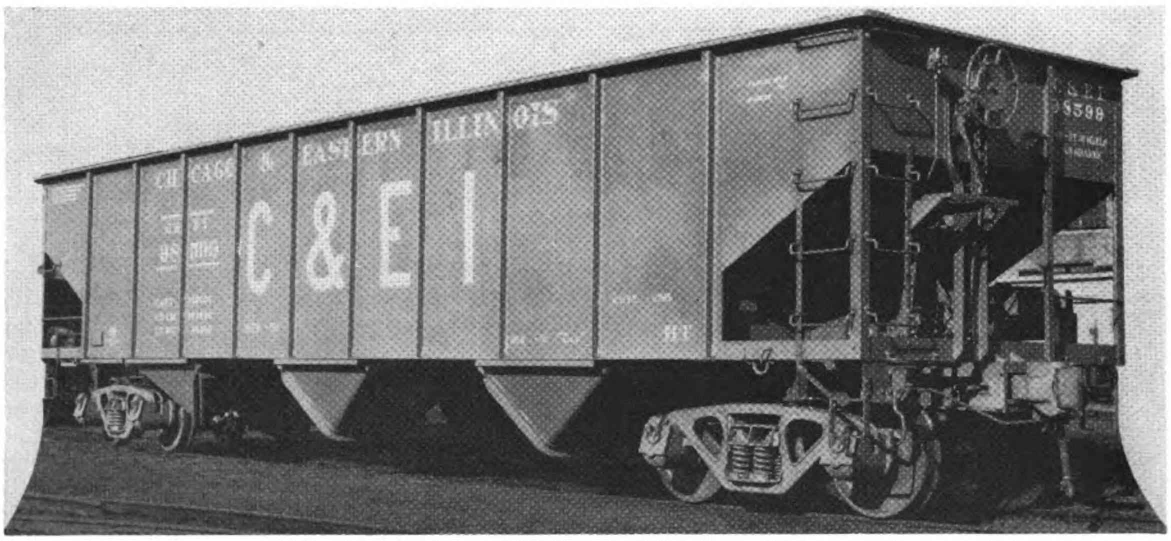
The can is slipped into place over the bronze filter with the gasket in place, and the entire assembly is pushed into the filter housing with the can left in position between the filter and the housing. The gasket is thus held by the four projections of the cut can in its proper position on the flange of the filter and cannot become twisted or pinched. The can also protects the filter from damage during handling, and it is stiff enough to hold the entire assembly in place for applying the spring and cap at leisure. When the filter has been assembled in the housing, the cut can is left in place as it offers negligible resistance to fuel flow.



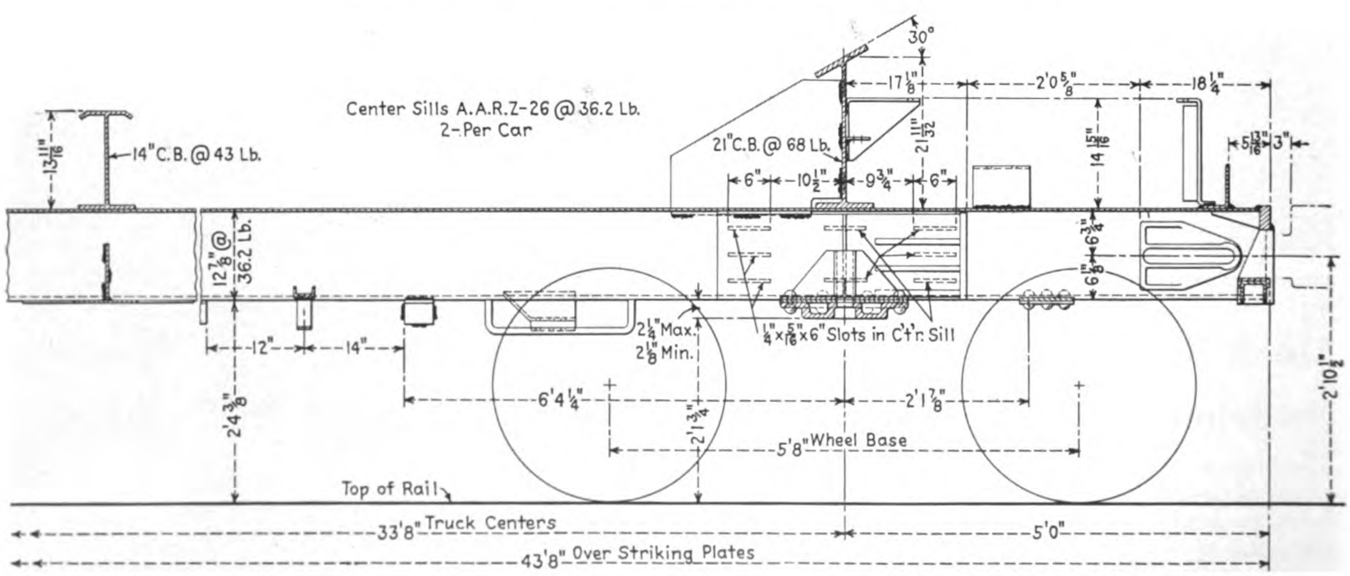
Cutting an old quart tin can as shown above protects E.M.D. filters and gaskets from damage during assembly



One of the 50-ton cars just out of the shop

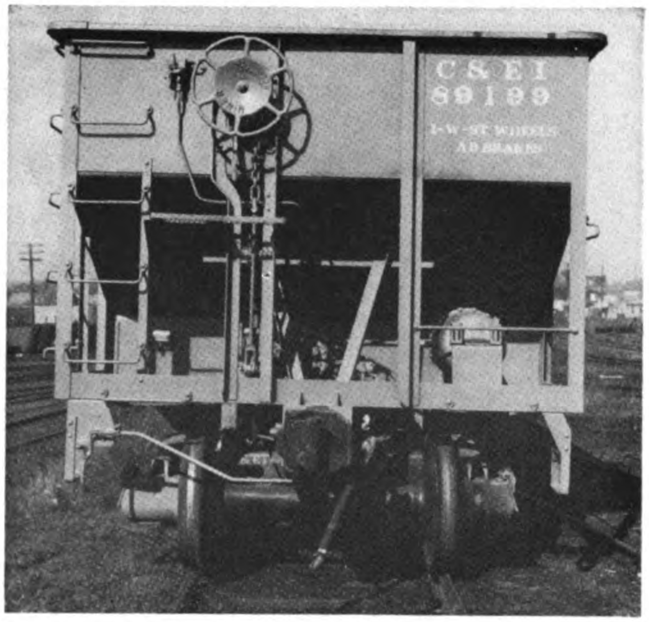


One of 300 new 70-ton welded hopper cars built by Pressed Steel Car Company



Partial cross-section of underframe of C. & E. I. hopper cars by Pressed Steel

C. & E. I. Gets New 50 and 70-Ton Hopper Cars



Cars have exceptional strength, and increased life in coal service is expected because of corrosion-resistant design features

THE Chicago & Eastern Illinois has received from the Pressed Steel Car Company 1,000 hopper cars of 70 and 50-ton capacities, which cost $5,570,500 and are intended for handling increased coal business, including that from Indiana and Southern Illinois mines to defense plants in adjacent territory. It is anticipated that the use of thicker sheets in contact with the load will in the long run reduce repair costs, as well as out-of-service time, and extend car life five to eight years.

The addition of this equipment will bring the total ownership of hopper cars on the C. & E. I. to 576 70-ton cars and 2,010 50-ton cars.

Two Types of Trucks Used

The 70-ton cars with three hoppers utilize Barber Type S-2-A Stabilized trucks with 6-in. by 11-in. journals. The 50-ton cars with two hoppers have A.S.F. Ride-Control trucks with 5½-in. by 10-in. journals. Both cars have outside stakes for better unloading, and the attendant loss of capacity due to slightly less inside width is made up by a small increase in car length. The cars are fabricated by welding and have just a few parts applied by riveting, such as center plates, draft-gear carrier irons, roping staples, door hinges and fixtures, and safety appliances. Comparative general dimensions and weights are given in the table.

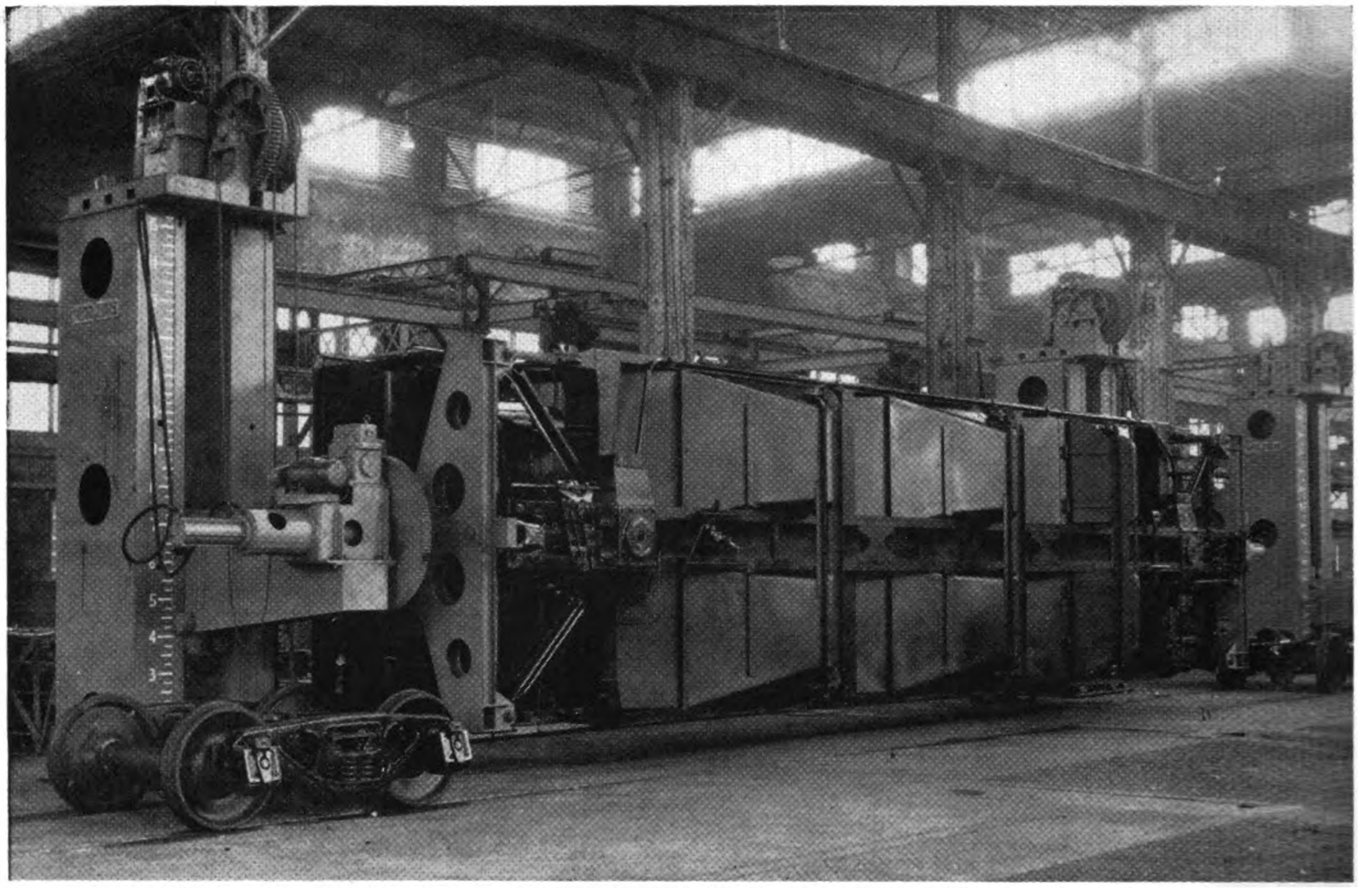
Plate thickness has been increased to give longer car life at some penalty in heavier weight, as illustrated by the 70-ton cars. The car sides have been increased from 3/16 in. to ¼ in. in thickness; floor sheets, hopper sheets, longitudinal hoods, doors, cross ridges and cross ridge knee braces from ¼ in. to 5/16 in. In other words, all parts of the car interior subject to wear and corrosion from the coal loading, are made 1/16 in. thicker than customary when copper-bearing steel is used as a structural material.

The result is an increase in car weight from 44,600 lb. for an earlier car of this type to an average of 48,400 lb. for the present design, or 3,800 lb. Studies have shown that hopper car floor sheets made of copper-bearing steel lose on the average about .008 in. of thickness per year due to corrosion and this may be increased to .012 in. per year for the lower parts of hopper sheets subject to maximum corrosion and erosion.* The anticipated increase in car life by adding 1/16 in. to the thickness of copper steel floor sheets is, therefore, five to eight years, against which must be charged the extra cost of heavier steel in the plates plus the expense of hauling this added dead weight around.

The center sills are A.A.R. Z-sections weighing 36.2 lb. per ft. welded together at the top. End sills are 6-in. by 3½-in. rolled angles. Side sills are 5-in. by 3½-in. rolled angles from end sill to bolster and 3½-in. by 3-in. angles between bolsters with suitable reinforcement at the hoppers. The bolsters are 21-in., 68-lb. I-beams with top flanges formed to suit the floor and securely welded to the center sill. Bolster gussets larger than usual are applied one on either side of the center sill, being welded to the bolster web, upper part of the center sill web and to the floor plate, thus greatly stiffening and strengthening the construction at this point.

On the 70-ton cars, fabricated steel bolster center fillers are slot-welded in place in accordance with approved current practice. All bolster ends are attached to the side sheets by welded angles which distribute the load by means of two rows of welding about 8 in. apart instead of a single buttweld at the bolster web.

* Reported in a paper by H. Malcolm Priest, manager, Railroad Research Bureau, United States Steel Corporation, published in *Railway Mechanical and Electrical Engineer*, June 1951, page 43.



Hopper car rotated in Pandjiris positioner at Mt. Vernon shops for down-hand welding

Two cross beams per car consist of 14-in., 43-lb. I-beams with the top flanges formed to suit the cross ridge floor sheet and securely welded to the center sill. Front draft lugs are drop forged and welded to the center sill, striking plates being of welded construction. Rear draft lugs, welded integral with the bolster center filler, are welded to the center sills.

Diagonal braces are 1/4-in. pressed steel except at the cylinder corner of the car where 5/16-in. steel is used. End posts are 3-in., 6.7-lb. Z-shapes. End sheets, 3/16-in. thick, are welded at the top to 5-in. by 3 1/2-in. rolled bulb angles.

The 1/4-in. car sides are stiffened with inside knee braces at the cross ridges, made of 5/16-in. pressed steel, side stakes on the outside being 1/4 in. Side stakes were at one time made without flanges but in this design short flanges are provided to assure good contact and welding to the side sheets. Corner posts are 3 1/2-in. rolled angles and longitudinal hoods 5/16-in. steel, as mentioned.

The 5/16-in. hopper sheets are welded to the center and side sills and have 3-in., 4.1-lb. channels applied underneath the chute. The 5/16-in. crossridge sheets are formed in one piece.

The upper floor is stiffened with a 4-in., 5.4-lb. channel welded to 3 1/2-in. angle floor supports. An additional floor stiffener, applied at the center sill, consists of a 3-in. by 2 1/2-in. angle.

All steel plates, sheets and strips are open-hearth steel with a .20 per cent minimum copper content, all other steel conforming to A.A.R. Specification M-116-49.

In building the C. & E. I. hopper cars at Mt. Vernon shops, every effort has been made to utilize a maximum amount of automatic and semiautomatic submerged-arc welding. In general the cars are assembled in 20 positions including two initial off-track underframe spots and nine positions each in the east and west bays with a transfer table connecting them at one end. The center sills are fabricated in the usual manner in another shop building where center fillers and longitudinal hood sheets are also applied. Car sides, side stakes and bulb angles are assembled in a separate progressive line and go through an automatic welding machine where pneumatic clamps hold the steel sheets firmly together and two welding heads are available, for example, to make welds on both sides of each side stake simultaneously. An unusual feature is exclusion from this assembly of the side sills which are built in with the underframe assembly.

In the first off-track spot, the center sill, as received from an adjoining shop, is placed in an underframe jig, and cross ridges, bolsters, floor sheets, also slope sheets, hopper sheets and side sills applied by tack welding. The asembly is moved by shop crane to the first track spot and mounted in an underframe positioner which permits readily revolving it to any angle required for most efficient welding.

Placed upside down on its own trucks, the underframe then moves through several positions where all underneath parts and equipment are applied. The underframe is righted and progresses to Shop Position 9 on a transfer table where the car sides are applied and tack welded preliminary to complete down-hand welding in one of two welding positioners, a special feature of this shop. These positioners were built by the Pandjiris Weldment Company, St. Louis, Mo. They are used to engage the car end, lift the car for truck removal and revolve it to any angle, through 360 deg., in three minutes. The

GENERAL DIMENSIONS AND WEIGHTS OF WELDED C. & E.I. HOPPER CARS BUILT BY PRESSED STEEL

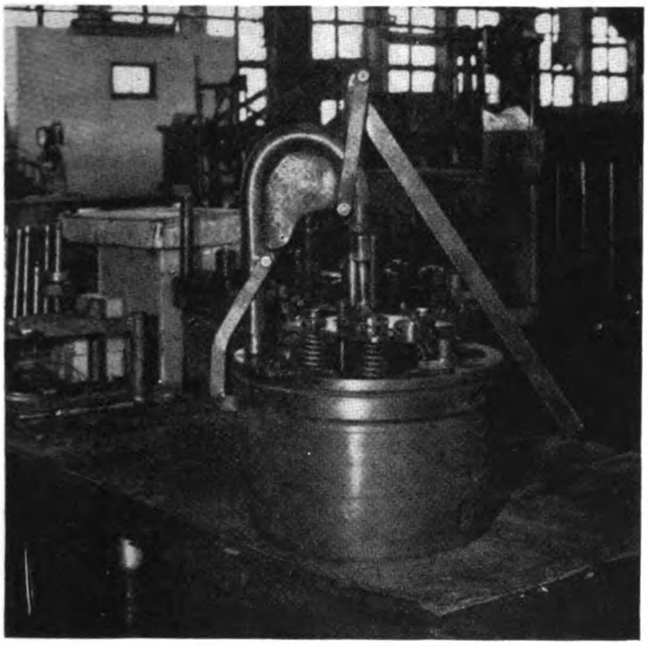
	50-Ton	70-Ton
Number of hoppers	2	3
Length inside of body, ft.-in.	35 - 0	42 - 8
Width inside of body, ft.-in.	9 - 10	9 - 10
Width over side top angles, ft.-in.	10 - 7¼	10 - 7¼
Length over end sills, ft.-in.	35 - ⅜	42 - 8⅜
Length over striking plates, ft.-in.	36 - 0	43 - 8
Distance between truck centers, ft.-in.	26 - 0	33 - 8
Center plate height above rail, ft.-in.	2 - 1¾	2 - 1¾
Height, rail to center of coupler, ft.-in.	2 - 10½	2 - 10½
Height, rail to top of side, ft.-in.	10 - 8	10 - 8
Drop-door length in clear at bottom, ft.-in.	2 - 10	2 - 10
Drop-door length in clear at top, ft.-in.	3 - 9	3 - 9
Width of drop doors in clear, ft.-in.	2 - 3	2 - 3
Capacity, level full, cu. ft.	2,172	2,785
Journal, size, in.	5½ x 10	6 x 11
Light car weight, lb.	40,200	48,400
Truck weight per car set, lb.	14,000	16,400

positioner columns are rigidly secured to a heavy foundation in the shop floor, but may be adjusted without great difficulty to varying car lengths or moved to another part of the shop if not needed for a particular type of car.

The point of engagement with the car body consists of a massive lifting bar with central rectangular steel plug projecting into the coupler pocket. The lifting bar also supports the end sill at each corner of the car. In operation, the car with couplers removed is rolled between the two positioner columns, lifting bars advanced into the coupler pockets by pneumatic cylinders and safety cables applied at the corners. The car is then ready to be lifted and revolved at will, this method of attachment being designed to support the car body at or near its center of gravity. The revolving mechanism and electric drive can therefore be kept within reasonable size limits. Power for lifting and revolving the car body is supplied to both lifting heads and all electric controls are carefully synchronized and interlocked for safety.

From the positioners the hopper cars proceed along the production line for conventional finishing operations. They are switched into the shot-blast house where a special device is used to lift the cars while the trucks are moved out of the building preparatory to shot blasting. All mill scale and dirt are eliminated down to the clean, base metal before final painting and stenciling.

With the production line timed to move at 20-min. intervals, Mt. Vernon shops turned out an average of 18 of the 70-ton cars a day and this production is increased to 25 a day with the smaller 50-ton cars.

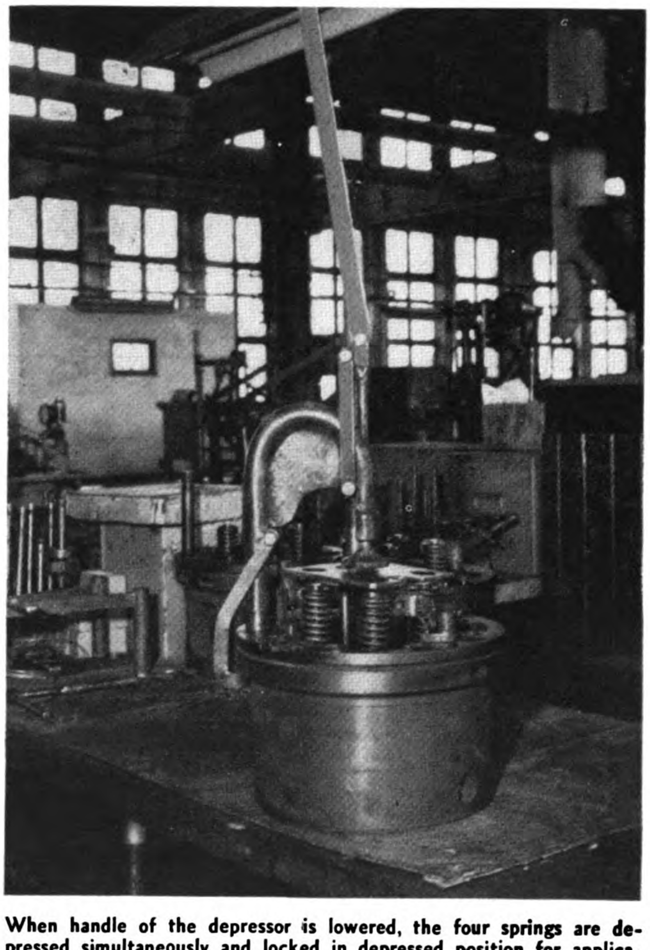


Valve spring depressor as applied. It is secured in place with the long leg of the U-shaped pipe over one of the rocker arm studs and the hook attached to this leg under the flange

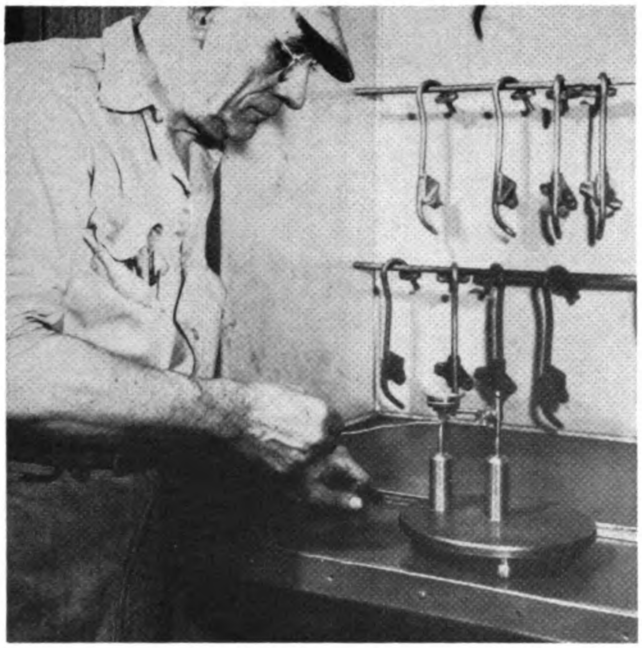
Hand-Operated Valve-Spring Depressor

Shop forces of the Chicago Great Western at Oelwein, Iowa, have built a hand-operated valve-spring depressor that depresses, simultaneously, the four valve springs on Electro-Motive heads for application of the half collets and locks the springs in the depressed position until released after the half collets have been put in place.

The long leg of the U-shaped pipe portion of the depressor slips over one of the rocker arm studs, and a hook affixed to this leg slips under the flange of the head to lock the depressor in place. As applied, the handle of the depressor is vertical. Lowering it depresses the four springs through a plate, and a cam action at the joint between the two members of the lowering linkage system locks the handle in place with the springs depressed.



When handle of the depressor is lowered, the four springs are depressed simultaneously and locked in depressed position for application of the half collets until handle is released



Piston clearance leads are miked in two or three seconds with this dial indicator arrangement

Gage for checking P-pipe assembly

Two Diesel Engine Gages

Two gages have been developed at the Citico shops of the Southern in Chattanooga, Tenn. The first gage reduces the time required for miking piston clearance leads to two or three seconds per lead. It consists of a dial indicator mounted on a 9-in. circular plate 3/4 in. thick and a fixed vertical rod. The leads are merely slipped between the fixed rod and the arm of the dial indicator, and an immediate reading is obtained.

The second gage checks the P-pipe assembly, and is also mounted on a circular plate 9 in. by 3/4 in. made of ordinary steel with a machined finish. The top of the gage is for the manifold end, and the bottom for the liner fit. The top has a hole for the manifold fit of the tube, and the bottom has a hole for the liner connections. To be acceptable, the P-pipe must fit both of these holes and the dowel holes.

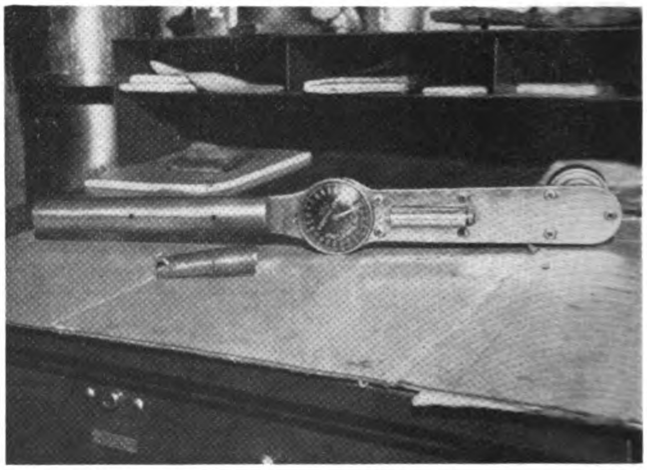
Keeps Torque Wrench Dial Housing Where Set

The Peoria & Pekin Union has devised a simple addition to a Snap-On torque wrench which prevents accidentally changing the setting on the dial housing, and thereby causing the indicating light to flash at the wrong foot-pound setting.

The addition is the short section of 1-in. piping shown in the illustration. This section includes about a third of the circumference on the large (right) end and about a quarter of the circumference on the small end, which is at the left in the illustration. The shoulder between the two ends is equal in size and shape on both sides.

The small end slips into a recess in the handle of the wrench far enough to line up a hole in the small end of the pipe section with the hole nearest the dial on the wrench. The hole in the pipe section is tapped to receive the thumb screw shown in place in the picture; the hole in the wrench handle is bored out large enough for threaded end of the thumb screw to slide in and out.

With the pipe section in place in the wrench handle, inserting and tightening the thumb screw draws the small end up. This forces the large end down with the shoulder between the two different-sized sections acting as the pivot point. As the large end is forced down it clamps the dial housing firmly and prevents unintentionally changing the ft-lb. torque setting through bumping or brushing against an object.



This small section of pipe clamps the dial housing in place at the torque setting desired and prevents accidental change in the setting

QUESTIONS AND ANSWERS

Diesel-Electric Locomotives*

Lubrication Oil Pump

433-Q.—What type lubricating oil pump is used? A.—It is of the positive displacement type employing a pair of helical spur gears as rotors.

434-Q.—How is it mounted and driven? A. — It is mounted on the free end casing and gear driven from the engine crankshaft through a spline arrangement.

435-Q.—Will there be any difficulty experienced when mounting a pump to the engine? A. — No precautionary measures are required, as a boss on the back of the pump assembly assures positive alignment.

436-Q.—What must be applied to the spline end of the pump before mounting? A. — Make certain that the thrust washer is applied to the spline end of the pump before mounting.

437-Q.—How are the gear and bearings lubricated? A.—The gear and bearings are lubricated from the free end gear spray. Additional lubrication for the bearings is supplied through the drive gear flanged bushing.

Pressure Regulating Valve

438-Q.—What is the function of the pressure regulating valve? A.—To control the oil pressure in the system.

439-Q.—What type valve is it? A. — An adjustable spring loaded regulating valve.

440-Q.—Where is it located? A. — On the discharge side of the lubricating oil pump.

441-Q.—How is the adjustment made? A. — The spring pressure is regulated by means of an adjusting screw which is held in place by a lock pin and protected by a lock nut or cap. To adjust the pressure, remove the cap and locking pin, turn adjusting screw clockwise to raise the pressure and counter clockwise to decrease the pressure.

442-Q.—What should the pressure be at full engine speed? A.—45 to 55 lbs. as shown on the gauge on the engine control panel.

443-Q.—What should the setting be when any work is done on the regulating valve? A.—The bench setting should be 80 to 85 pounds when any work is done on the valve.

444-Q.—Why is this done? A.—To allow for a line loss through the system, as the gauge pressure is taken at the end of the main header or the end of the system.

445-Q.—Is this adjustment final? A.—No. Final pressure adjustment should be made of 45 to 55 p.s.i. on the locomotive with the engine at full speed.

* This series of questions and answers relate specifically to the Alco-G.E. Diesel electric locomotives.

Lubricating Oil Filter

446-Q.—Where is the lubricating oil filter located? A.—Behind the air compressor on the left side of the locomotive.

447-Q.—What does the oil filter contain? A.—Eight filter elements, each equipped with a $\frac{5}{16}''$ orifice to maintain approximately a 20 p.s.i. pressure drop across the filter and to insure a definite quantity of oil for the engine.

448-Q.—What does each filter element contain? A. — Each filter element contains a sock type filter cartridge or it may be packed with $7\frac{1}{2}$ pounds of long strand cotton waste after installation of center tube.

449-Q.—What is each filter provided with? A. — Two drain valves and a vent line.

450-Q.—What is the purpose of the vent line? A.—To eliminate any formation of air pockets in the filter housing.

451-Q.—What is the purpose of the two drain valves? A.—When changing filters open the upper drain valve. When draining the entire system both drain valves should be opened.

452-Q.—What must be done to remove filter tank cover? A.—1—Open upper filter drain valve. 2—Turn filter tank lock ring counter clockwise and remove. 3—Remove cover and gasket.

453-Q.—What procedure is followed to remove cartridge and strainer? A.—1—Remove wing nuts. 2—Remove guide plate. 3—Remove cartridge and strainer from tank.

454-Q.—When about ta recharge cartridges, clean strainer and tank, what should be done first? A. — Turn cartridge cover and remove.

455-Q.—What should be done on cotton waste type cartridges? A.—Remove old waste and replace with $7\frac{1}{2}$ lbs. of clean filtering material. Pack cartridges so that there are no voids in the waste.

456-Q.—What should be done on the sock type cartridges? A.—The insert should be removed from the core tube and scrapped. Clean cartridge cage and apply a new sock.

457-Q.—What else should be done? A. — Clean oil strainer element by dipping in a cleaning solution and blow out with clean compressed air. Wipe out tank with a clean rag. *Do Not Use Waste.*

458-Q.—What method should be followed when replacing cartridges and strainer in tank? A. — 1—Place cartridge in tank so that they engage flanges in partition plate. (Hair pin bends will guide cartridge into place over the flange.) 2—Place metal strainer in tank so that it engages the center flange in the partition plate.

459-Q.—When the elements are positioned correctly in the filter casing, what should be done? A. — Close the drain valves and completely fill with clean engine lubricating oil.

460-Q.—How much oil is required? A. — About 30 gallons.

461-Q.—What operation should follow? A. — Place guide plate over cartridges and strainer allowing tie rods to extend through the proper holes in the guide plate.—Place strainer and cartridge center top bosses in the proper holes in guide plate.—Replace wing nuts on tie bolts and tighten until guide plate bears on all cartridges.

462-Q.—Before replacing filter tank cover what much be done? A.—Clean gasket groove to prevent possibility of leakage.

463-Q.—What should then be done? A. — Inspect cover gasket—renew if necessary. Press gasket firmly into bottom of groove.

464-Q.—After placing the gasket, what should be done? A.—Clean cover tongue and place cover on tank, making certain that the tongue is properly placed in gasket groove. Replace lock ring which should be turned securely in place. It is not necessary to "force" this ring.

465-Q.—What attention should be given the filter elements in order to keep the lubricating oil clean? A.—Filter elements should be re-packed periodically.

466-Q.—What would warrent immediate oil and filter change? A.—Any formation of sludge on these elements.

Lubricating Oil Cooler

467-Q.—What is the lubricating oil cooler? A.—A heat exchanger of the vertical shell and tube type.

468-Q.—How many coolers are provided? A.—One for each engine.

469-Q.—Where is the lubricating oil cooler located? A.—Behind the air compressor on the right side of the locomotive.

470-Q.—In what way does the cooler function? A.—To keep the lubricant at a predetermined temperature for efficient lubrication of engine parts.

Schedule 24 RL

Air Brakes

Suggested Procedure When Pipes Are Broken. Automatic Brake Valve.

1312-Q.—Is a locomotive brake available?

A.—Yes. If the independent brake valve is not mounted on the automatic brake valve pedestal, the independent brake valve can be used if the main reservoir loss of air is cut off.

1313-Q.—What should be done if stop reservoir pipe 8 is broken?

A.—Close pipe on the brake valve side by short tight bend to be able to obtain a train overspeed or safety control release. The service application portion cut-out cock can be closed and proceed without any repairs.

1314-Q.—What must be done if second reduction reservoir pipe 18 is broken?

A.—Proceed without any repairs.

1315-Q.—How is the operation affected?
A.—Safety, overspeed and train control brake pipe reductions are unlimited.

1316-Q.—What action should be taken if the suppression reservoir pipe 19 is broken?
A.—Repair leak on brake valve side by tight close bend on the pipe.

1317-Q.—How is the operation affected?
A.—Proceed with loss of permanent suppression feature.

1318-Q.—Suppose that suppression pipe 26 or 17 is broken?
A.—Repair leaks on brake valve side by close tight bend. Proceed with loss of partial suppression.

1319-Q.—What can be done in the event that gage pipes are broken?
A.—Repair leak with close tight bend and proceed without the use of gages.

Independent Brake Valve and Rotair Valve

1320-Q.—What must be done if main reservoir pipe 30 is broken?
A.—If broken at any point repairs must be made to have the use of independent brake valve.

1321-Q.—Suppose that the break occurs in the branch to the independent brake valve?
A.—Stop the loss of main reservoir air and the controlled emergency feature is still available.

1322-Q.—Is the automatic brake affected?
A.—No.

1323-Q.—What action should be taken if the actuating pipe 13 is broken?
A.—Proceed without any repairs.

1324-Q.—What feature is thus lost?
A.—The independent quick release feature is lost.

1325-Q.—What precaution must be taken?
A.—The brake valve handle must not be placed in lock-down position.

1326-Q.—What action should be taken if the application and release pipe 20 is broken?
A.—Proceed with the independent brake valve handle in release position (not locked down).

1327-Q.—What feature is lost?
A.—The independent locomotive brake.

1328-Q.—What should be done if controlled emergency pipe 35 is broken?
A.—Place rotair valve in *PASS* position.

1329-Q.—What features are thus lost?
A.—The controlled emergency feature and other freight functions of split reductions, etc.

Brake Cylinder Relay Valve

1330-Q.—What must be done if main reservoir pipe 6 is broken?
A.—It must be repaired to have a locomotive brake.

1331-Q.—In the event that repairs cannot be made, what should be done?
A.—Stop loss of main reservoir air and follow instructions of the railroad involved?

1332-Q.—What action should be taken if brake cylinder pipe 30 is broken?
A.—Same as for main reservoir pipe *6*, unless break in cylinder pipe is beyond the cylinder cut-out cock in which case close the cut-out cock and proceed with these brake cylinders cut out.

1333-Q.—What should be done if control pipe 16 is broken?
A.—It must be repaired to have a locomotive brake. Otherwise, follow the instructions of the railroad involved.

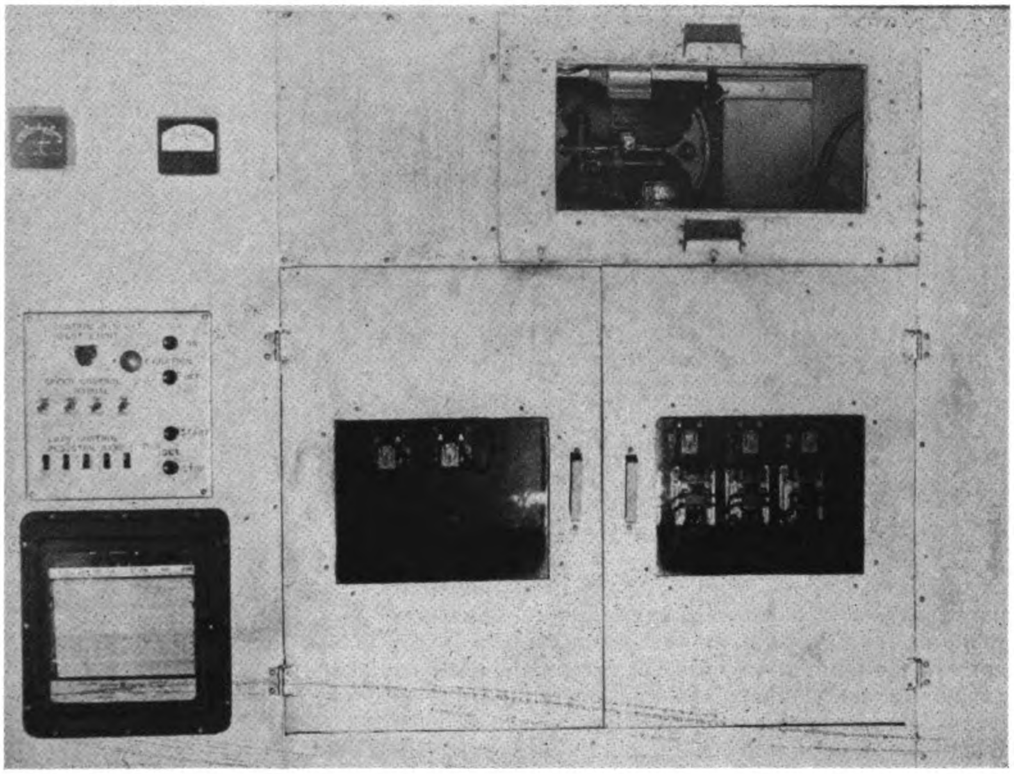


Fig. 1—Front view of the voltage regulator test stand showing the control panel. The recording voltmeter and tachometer are shown at the lower left. The regulator being tested is behind the glass panel at the upper right

Test Rack Improves Locomotive Operation

Effective means for testing, developed by the Atlantic Coast Line, make it possible to restore auxiliary generator voltage regulators to their original condition

THE ATLANTIC Coast Line Railroad Company has recently placed in service at their Waycross, Georgia, Shops, what is believed to be the first fully automatic diesel auxiliary generator voltage regulator test equipment that has been built by any of the railroads in the country. This test rack was designed and constructed by Mr. H. F. Woodside, assistant electrical foreman.

The maintenance of correct auxiliary generator voltage is of vital importance to the proper operation of the diesel locomotive. Failure of the voltage regulator to hold this voltage within proper limits can produce several annoying and costly maintenance experiences. Low voltage will permit the battery to become discharged,—decreasing battery reserve protection of the control bus, and eventually resulting in a cranking failure, which may mean train delays. High voltage may cause a blown generator fuse, which if not detected and corrected in time, inevitably causes a road failure. High voltage subjects the battery to an excessive amount of charge, causing abnormal water consumption and violent cell gassing. These in turn mean heavy grounds, increased maintenance to clear grounds and water the battery, with short battery life paying the final price.

Diesel electricians for several years have realized

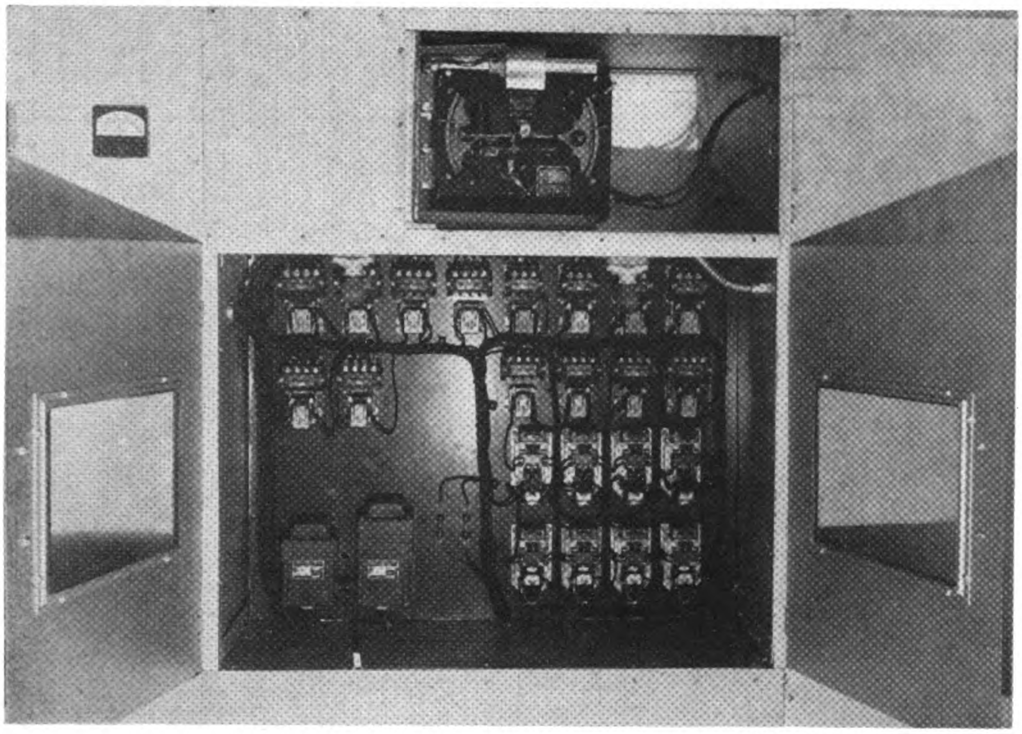
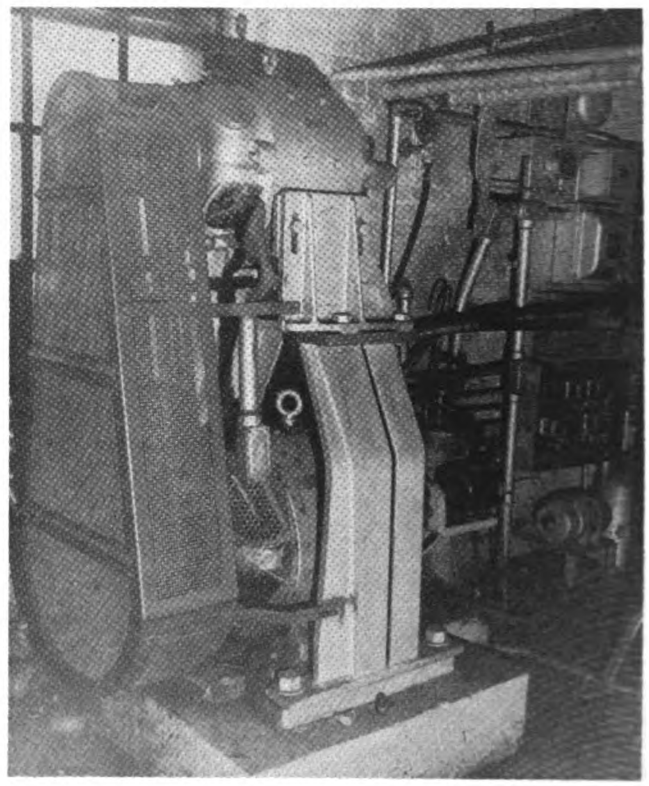


Fig. 2 (Left)—The voltage regulator test stand with cabinet doors open showing the control relays and the voltage regulator in position

Fig. 3 (Below)—The d.c. motor and auxiliary generator drive for the voltage regulator test stand



from their battery record cards that something has been amiss with the adjustments they have made to the voltage regulators. They have known that settings made in the shops which were correct, have not been maintained on the road after full load and maximum operating temperatures occurred. Checks on the road have shown that the regulators were not holding the auxiliary generator voltage constant at both idling and running speeds, and that voltages increased several volts above shop settings after maximum operating temperatures occurred. A number of regulators were found so erratic, that with engines running steadily at idle speed and auxiliary generator loads constant, the voltage would suddenly jump four or five volts.

These observations definitely indicated that a facility was needed that would accurately check the behavior of the voltage regulator under all road operating conditions. As a result, Mr. Woodside designed a test rack which is capable of, both automatically and manually, subjecting the regulator to all of the variable load temperature and generator speed changes which can occur in normal service.

Equipment Required

The regulator test rack consists of the following:

1. A motor generator set, using an E.M.D. 10-kw. auxiliary generator, vee belt connected to a variable speed d.c. motor. The motor control features permit operation of the generator through the full range of speeds occurring in a diesel locomotive. Speeds may be controlled automatically, or manually, through approximately five equally spaced steps between idle and full engine speed.

2. Auxiliary generator loading is accomplished by means of a variable resistor. When in automatic operation, the load is adjusted to full generator rating when the generator is turning at minimum speed. As the speed automatically increases, the load is simultaneously reduced in approximately five equal steps to about 20 per cent of generator rating by the time full generator speed is reached. The low-speed cycle is then automatically reversed and the load increases as the speed decreases. It takes about twelve minutes for the equipment to complete a cycle of operation from maximum load, minimum speed, through minimum load, maximum speed, back to maximum load, minimum speed. This automatic cycle of operation will continue indefinitely without attention. Under manual operation, any selection of speed or load condition can be made and maintained

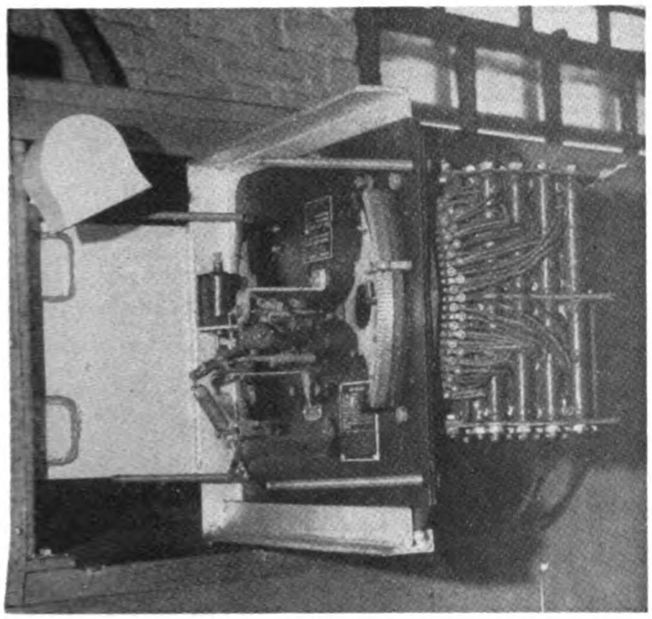


Fig. 4—Swing-out mounting for the voltage regulator to be tested

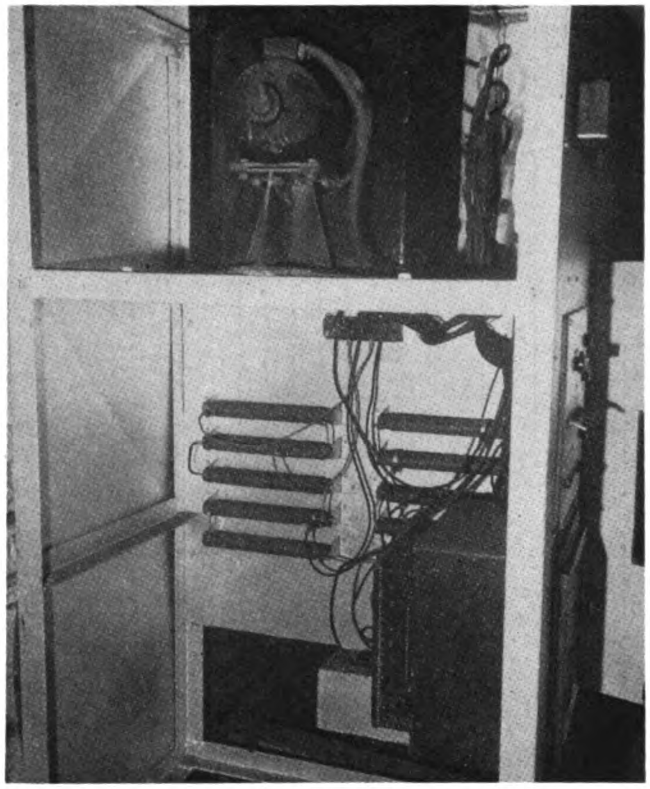


Fig. 5—The blower fan is shown above and the d.c. motor-drive field circuit resistors below

indefinitely. Incorporated with the resistor bank is a cooling fan, which transfers heat from the resistor bank into the compartment of the test rack where the voltage regulator on test is mounted for the purpose of producing temperature conditions under which the regulator would normally operate in road service.

3. A 32-cell diesel battery, reverse current relay, and battery charging contactor panel completes the auxiliary generator equipment.

4. The test rack control panel includes the following:
  a. One selector switch for manual automatic control.
  b. Four single-pole toggle switches for manual speed control.
  c. Five single-pole toggle switches for manual load control.

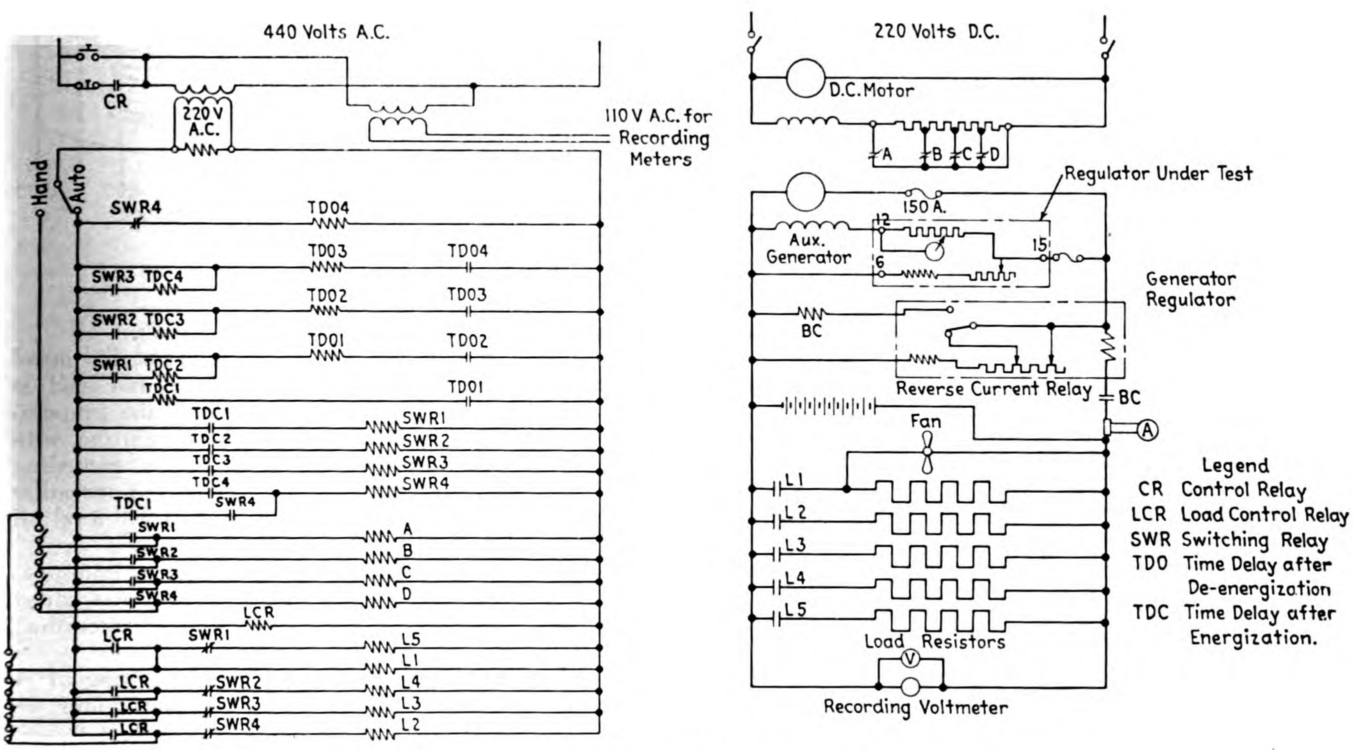


Fig. 6—Wiring diagram for the voltage regulator test stand

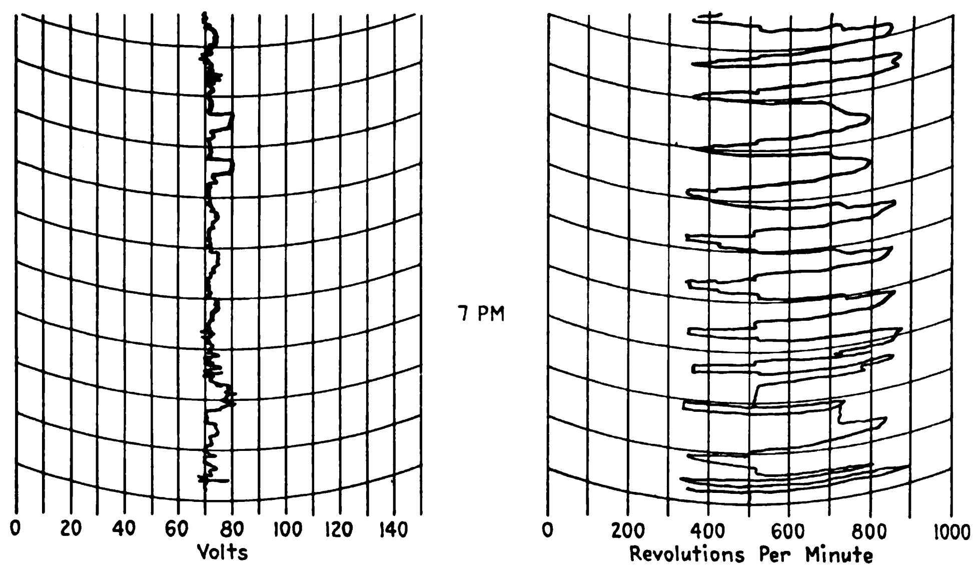


Fig. 7—Record of preliminary test showing the performance of the regulator before final adjustment. Left: regulated voltage. Right: speed of auxiliary generator

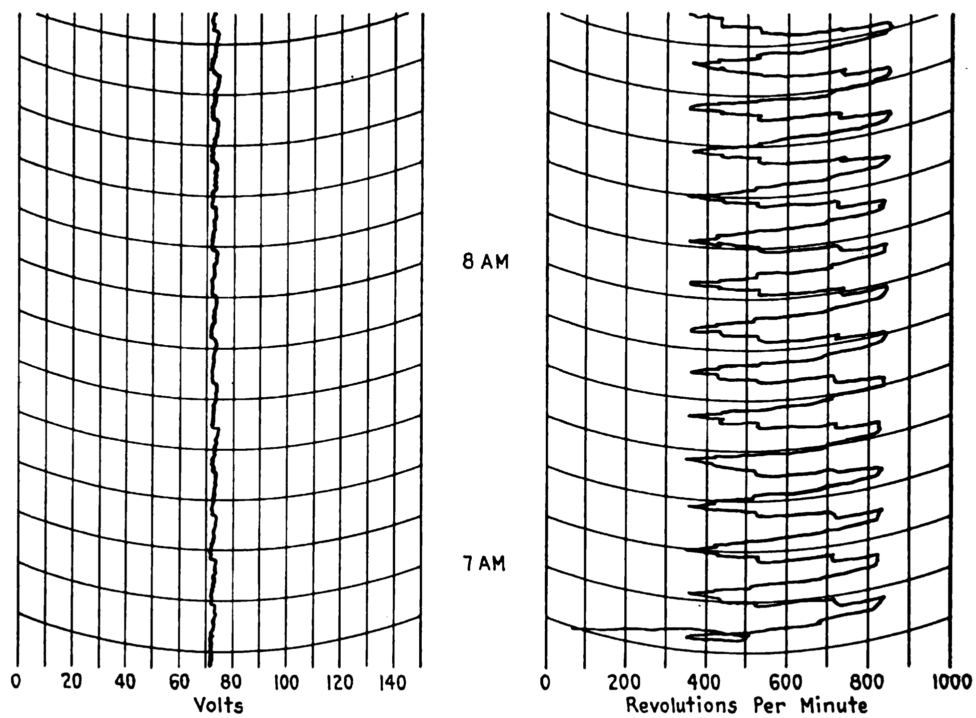


Fig. 8—Regu'ator performance after final adjustment

d. One *on-off* pushbutton unit control-circuit switch.

e. One *on-off* pushbutton unit for the d.c. motor starter.

f. A control-circuit pilot light.

5. The relay control panel includes time delay relays for controlling the variable generator speed and load changes described in sections 1 and 2. (See wiring diagram and parts list.)

6. A General Electric duplex inkless type recording meter for generator voltage and r.p.m., voltage scale 0-150 d.c., r.p.m. scale 0-1000. (See parts list for specifications.)

Operation of Test Rack

1. Mount regulator to be tested in rack and make all electrical connections to regulator.

2. Switch on control circuit.

3. Start motor generator set.

4. Set selector switch for manual operation.

5. By selection of proper speed and load control switches, set generator speed at minimum and load at maximum, allowing equipment to run until the temperature of all parts becomes constant. When starting with equipment cold, the voltage as shown by recording meter will be low. It will gradually rise as the operating temperature of the equipment increases and will level off when normal operating temperature is reached.

6. Reduce load on the auxiliary generator to minimum by selection of the proper load control switch, and adjust the speed to about 500 r.p.m., as shown on recording meter.

7. Adjust voltage regulator to a nominal setting of 74 volts in accordance with manufacturer's instructions.

(*Continued on page* 86)

DIESEL-ELECTRICS—How to Keep 'Em Rolling

9 Inspection and Tests— Gears and Pinions

Not only will gears and pinions have long life when they are given the attention all precision machinery deserves, but many road failures will be eliminated and other equipment protected from shattering vibration

Too little is known and done about this important piece of locomotive equipment.

Have you ever looked at the shape of your gear teeth? It takes only a moment, but it pays big dividends. It is better than any other one move you could make to check on the welfare of your traction motors.

This is the ninth of a series of articles on maintenance of diesel-electric equipment. This article is written by J. W. Teker, Locomotive and Car Equipment Department, General Electric Company, Erie, Pa.

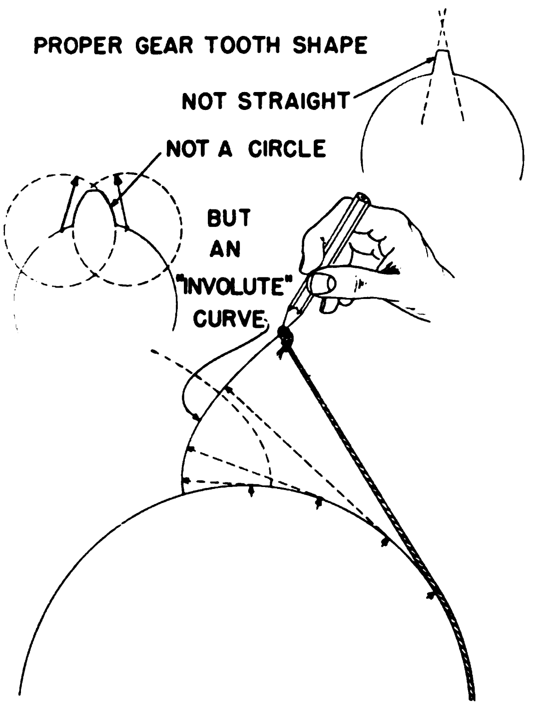


Fig. 1—How a gear tooth is formed

Poor Gearing Invites Troubles

Many a motor failure has been hastened by punishment from bad gearing. Damaged gear teeth not only hurt themselves but, like a toothache, spread their misery all around. We are concerned about bad gearing because of what it may do to the motor. Let's see how this happens.

The gear is shrunk on the axle, and turns steadily as the wheel rolls on the rail. It just doesn't have any choice, unless the wheel slips. Each bad gear tooth bumps the pinion and kicks it into a jerky, vibrating motion. As the pinion goes, so goes the armature and all its parts. Also, these same kicks are carried through the bearings and shake the motor frame and all it contains. At full speed, believe it or not, more than a million blows are struck every 30 minutes! Figure it out for yourself,—take motor r.p.m. and multiply by the number of pinion teeth to get blows per minute. No wonder gear-builders strive to shape teeth accurately. No wonder they worry about thousandths of an inch, in order to get gearing that will pass power smoothly between the motor and the driver.

The Fine Points of Gearing

Gearing is very clever and exact machinery. The maintainer's job is to keep it that way. Remember this when you are checking gear teeth, and don't be fooled by their

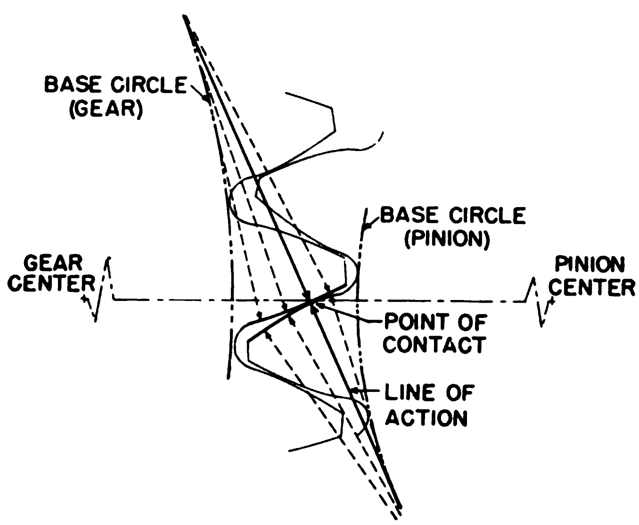


Fig. 2—How gears transmit power

simple appearance. The entire secret of smooth working gears lies in the shape of the tooth. It's not straight, and it's not round. It has the smoothly changing shape of an "involute" curve. This curve has an increasing radius, as if it were drawn by a pencil on the end of a string unwinding from a cylinder (Fig. 1). Try it for yourself.

This tooth shape is the exact part of gearing, and the way it works to get smooth motion is really amazing. The diagram in Fig. 2 will make this clear. As long as the teeth are in mesh, the points of contact between them are always in a straight line,—the line of action, Fig. 2. This line goes from around the base circle of the gear over to the point of contact. Here it merges with the contact line of the other tooth which goes to the base circle of the pinion. These two lines of contact join to form the straight line of action between the two base circles. As long as the teeth keep their proper shape, they push along the line. This turns the two base circles steadily, as if they were connected by a non-slipping belt.

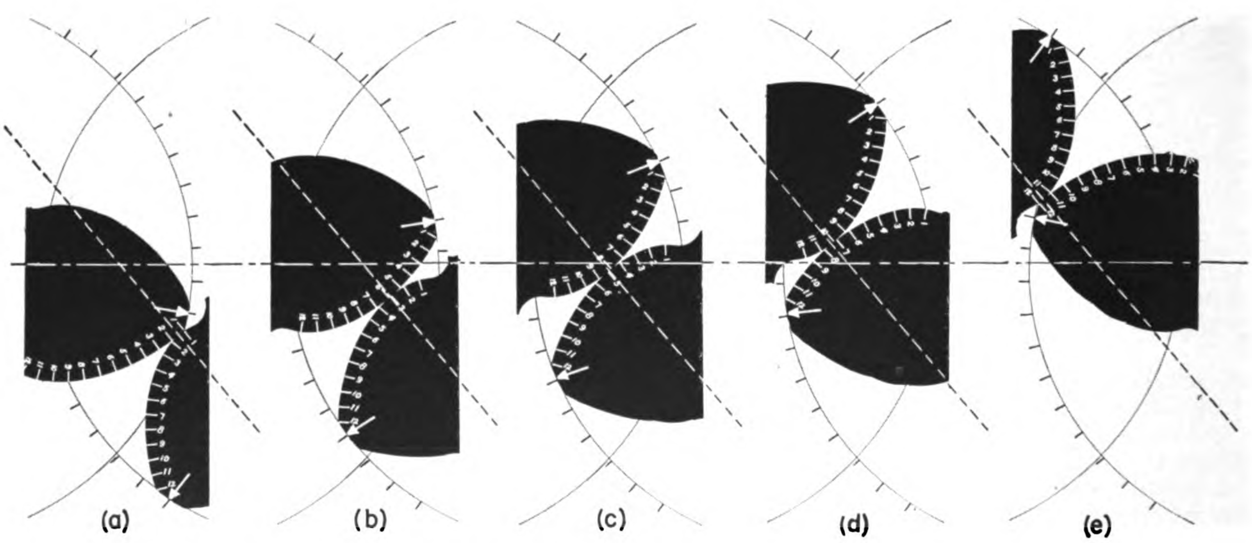
Clever and exact as this machinery is, it does have a weak spot. The teeth slide on each other as they drive the locomotive. So, like a bearing, they must be separated by a lubricating film. Otherwise, metal will rub on metal and scuffing, overheating and destructive wear will start at once.

Maybe you find it hard to believe that gear teeth really slide. The model in Fig. 3 was photographed to show this. You can see how fast the teeth slide when they first enter mesh, by comparing (a) and (b). Then they slow down to a rolling or rocking motion in the middle of the mesh, (c). This is the point where the line of action crosses the center line between gear and pinion, (Fig. 2). Then they slide apart with increasing speed as they leave the mesh (d) and (e). You can actually see this sliding. Chalk the sides of a couple of teeth and draw some pencil lines across them. Then follow their movement as the gear is turned slowly. Don't be satisfied until you see this for yourself. If you keep this action in mind, you will understand how gear teeth wear.

You know how a wheel will run smoothly for thousands of miles, but let it slide for only a short distance, and it will have a flat spot. After that it thumps and

Fig. 4—Worn pinion showing step and scuffing lines on teeth

pounds with every turn. Similar damage results to the accurately shaped gear teeth if they are not properly lubricated. Because sliding is greatest towards the tip and base of the teeth, these portions wear fastest. The result is that two flat-like areas are worn into the face of each tooth. It is this uneven wear from tip to base that changes the all-important shape of the teeth, (Fig. 5). It not only leaves a ridge where the teeth roll on each other, but also digs a step at the base of the teeth. Instead of thumping only once with each turn like a flat wheel, defective gears pound with each tooth contact. Just count the teeth on a gear to get an idea of what rapid fire hammering this is. And remember, it gets worse as train speed goes up.



(a) Teeth entering mesh. No. 1 marks on both scales correspond
(b) Teeth approximately 1/3 through mesh. Scales show that upper tooth has slipped 3 divisions over lower tooth
(c) Teeth half through mesh. Scales still displaced about 3 divisions. Teeth have been rolling from (b) to (c)
(d) Teeth approximately 2/3 through mesh. Displacement still about the same. Teeth have continued to roll.
(e) Teeth leaving mesh. No. 12 scale marks correspond. Lower tooth has slipped 3 divisions over upper tooth

Fig. 3—Diagram illustrating action of teeth in going through mesh

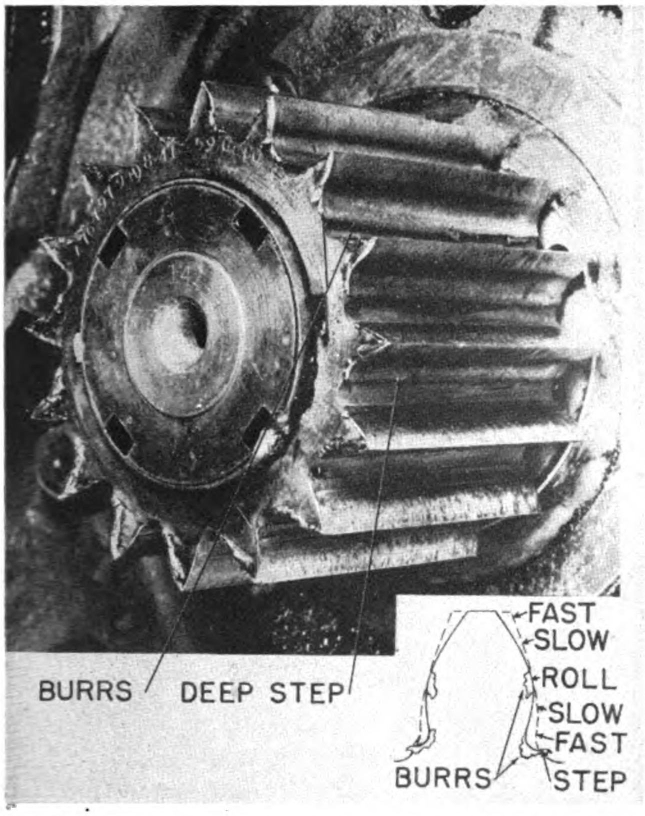


Fig. 5—Example of bad tooth wear resulting from lack of lubrication

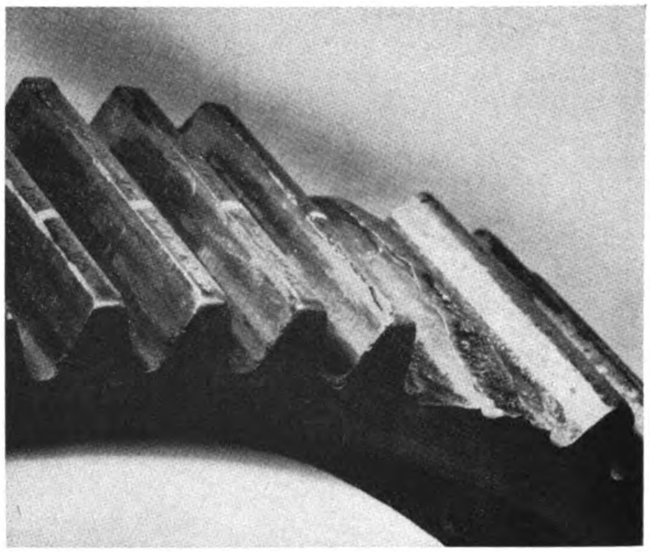


Fig. 6—Traction gear with two broken teeth

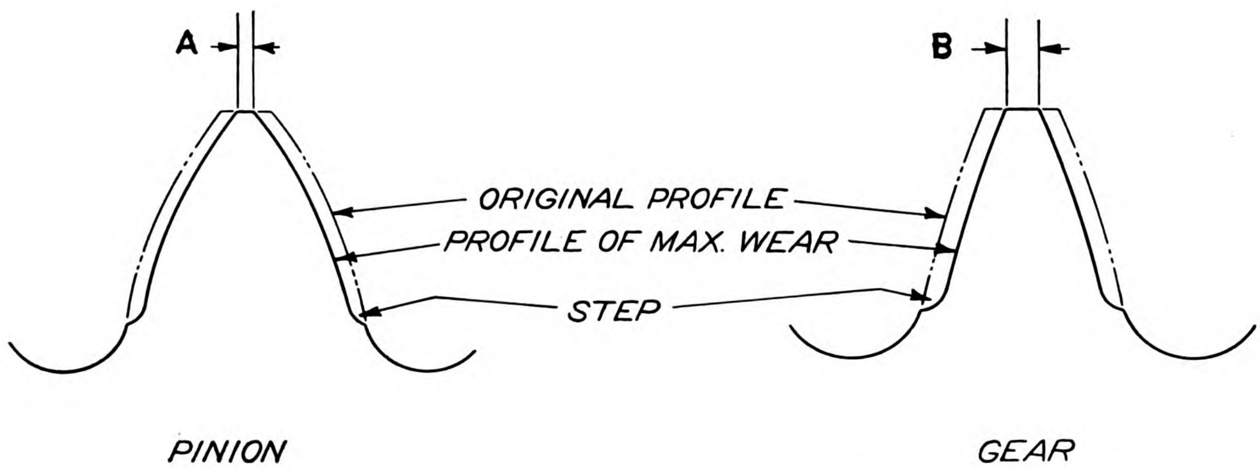
Keep Good Tabs on Gearing

Every wheel change is an opportunity to inspect the gear and pinion. Of course, they're covered with sticky lubricant. But don't let that hide the story the gear teeth want to tell. You only need to clean a couple of teeth to find out what's going on. Be careful how you do it, though. The black film may hide jagged edges or razor sharp burrs. It's best to wear gloves and apply the solvent with a brush or plenty of cloth.

A damaged tooth profile will show a ridge across the face of the tooth. Some maintainers like to use templates or gages to help them judge the shape of the tooth. These are accurately ground to fit correctly shaped teeth. When such a template is placed against the face of the tooth being inspected, the change in shape is easily seen.

The big question is when to reject gearing with defective tooth shape. A whole lot depends on the kind of service, the amount of wear, gear breakage and motor repair history. In general, gearing for fast road service should be maintained to higher standards than gearing for switching duty. Speed makes a lot of difference. Here's why. It takes only a small force to slowly rock an armature back and forth. But the force required to jerk it back and forth the same distance at high speed is terrific and punishing. Worn gears that might get by in low-speed switching work may result in a whole series of costly motor repairs if run in high-speed service.

Now look at the step worn at the base of the tooth (Figs. 4 and 5). It does no harm as long as the same gear and pinion remain mated on the same gear centers. One has worn a pocket for the other, so they run all right. But if the axle linings are changed, or the gears are interchanged—watch out! Then the step interferes with the



Dimetral Pitch of Gearing	Condeming Limits A	B
2 (or coarser)	1/16 in.	1/8 in.
2 1/4	1/16 in.	1/8 in.
2 1/2	1/16 in.	1/8 in.

Dimetral Pitch of Gearing	Condeming Limits A	B
3	1/32 in.	1/16 in.
3 1/2	1/32 in.	1/16 in.
4 (or finer)	1/32 in.	1/32 in.

Fig. 7—Condemning limits for worn teeth

Fig. 8—Fatigue cracks and ultimate breakage of gear teeth

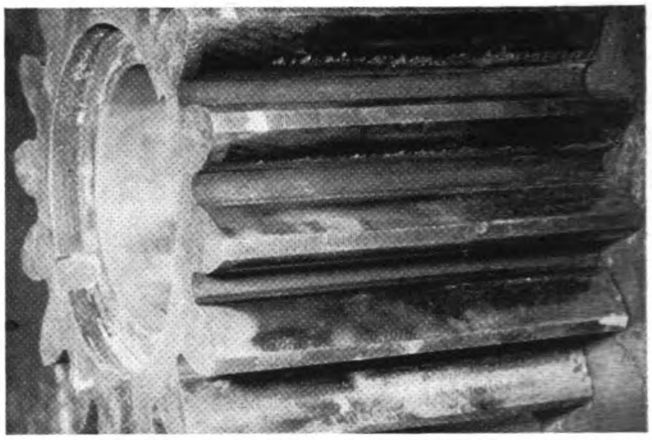


Fig. 9—Pinion showing light pitting at base of teeth

Fig. 10—Gear teeth severely damaged by progressive pitting

tip of the tooth on the mating gear. That means crunching and battering of steel against steel, that no lubricant can help, until an uneasy agreement is reached. Worse yet—carefully built new gearing is ruined when run against bad gearing. Such costly, high-power machinery was never intended to operate under these conditions. It should not be surprising if a tooth breaks out, or if armature parts or windings fail.

Check on Lubrication

Rather than wonder how much destruction the gears can stand, wouldn't it be better to let these inspections serve as a check on lubrication? Suppose, for instance, you find no step, the tooth face is smooth and the profile is in good order. Most likely enough lubricant is being added at the right time. Of course, there is the chance of wasteful practice, with over-ful or leaky gear cases.

On the other hand, suppose you find worn gearing. Even though the teeth are covered with lubricant when you make the inspection, you find a step. There are also strong tell-tale scuff marks running from the base to the tip of the tooth face (Fig. 4). This could mean that the gearing was working dry for some time. Then, shortly before it was inspected, enough lubricant was added to cover the teeth. If this is a general condition, it may mean that not enough lubricant is being added, or that the interval between fillings is too long. Maybe both things happened. Maybe the lubricant is not suitable. Maybe too much was lost from the gear case between fillings. If the failure of lubrication was long ago and lasted only a short time, the scuff marks will be faint and polished, and there will be hardly any step.

Watch for Danger Signs

The whole object of gear inspection is to study evidence. Then, if you know how gearing works, you can make a shrewd guess as to the cause of the trouble.

Continual wear reduces the thickness of the gear teeth. The step cuts deeper and deeper into the tooth (Fig. 5). Even the ridge is crushed or rolled away. This causes a sharp burr to stick out at the sides of the tooth, in line with the ridge, as the rest of the face wears away (Fig. 5). Watch for this. Of course, the space, or backlash, between teeth gets greater as the gears wear. Such gearing may be quite noisy, and may make quite a "clunk" when it is reversed. But, the greatest concern now is the danger of a tooth breaking out.

Metal, like people, gets tired when overworked. If its "endurance limit" is exceeded too often, it will break. This can happen to a gear tooth sticking out from the rim. Originally, it was built strong enough to take the bending strain that goes with the service it was designed to perform. But, when wear cuts the size of the tooth down, it is weakened. Then the battering of step interference, plus blows from the damaged profile gang up on the poor tooth at high speed. What can you expect? A crack starts, usually at some surface defect. It is small at first, but grows down into the body of the tooth. When the weakened section gets small enough, the tooth suddenly breaks off (Fig. 6). This takes time, and perhaps you will have a chance to discover the crack before

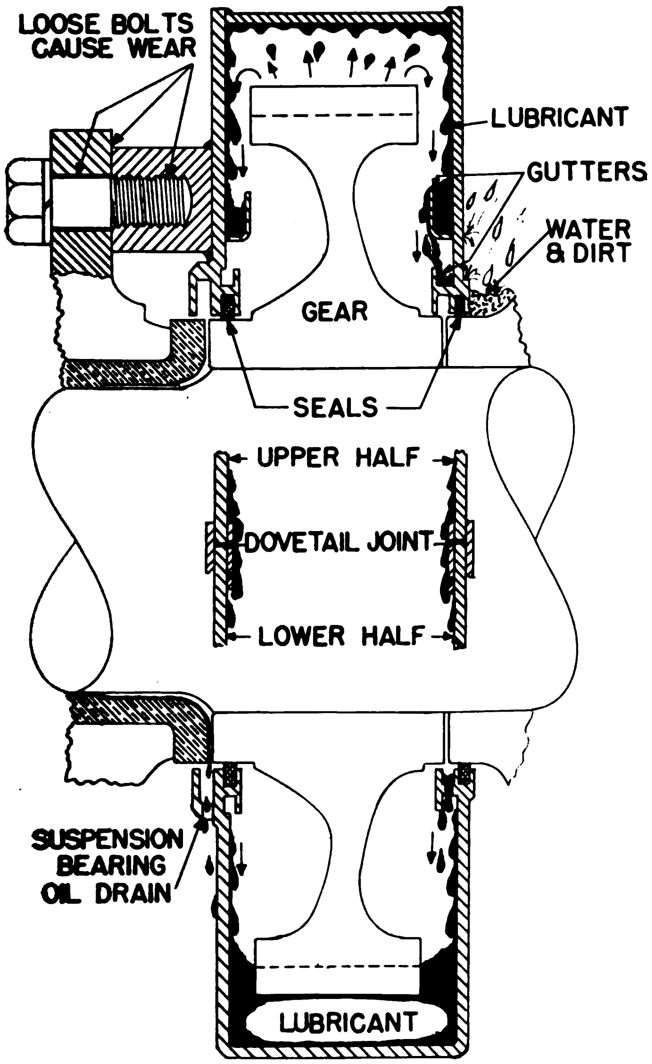


Fig. 11—Section through typical gear case.

failure occurs. Of course, when you're checking for cracks, all teeth must be cleaned of lubricant. Magniflux or similar detection methods are helpful in locating such faults.

Gearing should be condemned and removed from service before it breaks. Just when to do this is hard to judge with certainty. What damage is the worn gearing doing to the motor? How much longer will the teeth last? These questions can only be answered in a general way. The table in Fig. 7 shows condemning limits for gear teeth according to their diametral pitch. To get the diametral pitch, divide the number of teeth on a gear or pinion by its pitch diameter in inches. This is a handy way to classify the size of gear teeth.

Examples of cracked and broken teeth are shown in Fig. 8. Gearing should be condemned as soon as cracks reach to, or extend around, the ends of the teeth.

Occasionally, tiny pieces of steel will flake out of the face of the tooth leaving holes (Fig. 9). This is called pitting. It is caused by very heavy loads concentrated on these small areas. New gears are more apt to pit because high spots in the surface finish are being crushed out in service. Another reason for pitting is shaft deflection under load. Very heavy starting loads tend to deflect the pinion shaft and skew the contact with the gear teeth. This overloads the contact area close to the motor. Pitting takes place until the contact area is spread over enough of the tooth face to reduce the load. After this, pitting should cease and finally clear up. It is a kind of fitting-in process, especially where heavy loads are usual, and should cause no alarm.

If pitting should continue until large pieces fall out of the tooth, it is a different matter (See Fig. 10). The gearing should be removed from service before it has been weakened enough to fail. The working surface of such gearing is unable to carry the load that was put on it. Gather all the information you can to help determine the cause of the trouble. How long did the gearing run? What kind of service was it in? What was the lubrication history? What does the gear or pinion with which it was mated look like? Measure the hardness—it may be soft from overheating. If it is a pinion, it may have been overheated when it was mounted. Also, gearing gets very hot when it is run without lubrication. You know what would happen to a journal bearing running dry. Of course, soft gearing is not able to carry the load intended for properly hardened and heat-treated teeth.

The Job of the Gear Case

The gear case, simple as it is, does several important jobs for the gearing it houses. It keeps flying ballast out of the gear teeth and protects them from bumps. Look for dents in the gear case deep enough to rub on the gearing. Also look for punctures and broken welds that may let lubricant escape.

The job of keeping lubricant in the gear case is a tough one. Don't underestimate it. When heated to operating temperature, the lubricant flows like a liquid; yet it clings to and creeps along all surfaces. It is thrown off the spinning gears and then flows back to the bottom of the case along the side walls (Fig. 11). It must get by the horizontal split in the case and around the gear hub without escaping. Gutters around the hub opening deflect the lubricant away from the running seals to make their job easier. See that these gutters are not flattened or broken loose. Also, the dovetail joint between the upper and lower halves of the case must be snug. These may seem like small items, but they are important. Check the spring or latch on the filler opening lid—also the seal material is tightly closed. Lubricant can be lost here so fast that the level may get too low before a run is finished. Splattered trucks and underbody are your first clues to bad order lids.

Don't overlook the space between the gear case and the motor. Careless filling, or leaking of the lubricant may plug this space or the motor air vents. This interferes with the cooling of the motor windings and bearings.

Felt seals are used for closing the gap between the gear hub and the case. These should be soft enough to make a good rubbing seal. Felts that are hardened or shriveled after the gear case has been washed in caustic solutions should be replaced. Don't forget to check the felt on the filler lids too. If these seals are not tight, water and grit will enter and mix with the lubricant. This will form a lapping compound—just like throwing sand in a journal bearing.

It is also important to see that the oil catching trough drain is clear. This lets the surplus oil from the thrust flange of the suspension bearing drain clear of the gear case. If this oil got into the gear case, it would dilute the lubricant and make it unfit to do its job.

Check all the bolts holding the gear case to see that they are tight. Use a hammer the same as on axle cap bolts. If the gear case is allowed to jiggle, the supports, bosses

and bolts will wear. This leads to costly back shop repairs.

The gear case is as important to the traction motor as the crankcase is to the diesel engine. Each part has a job to do. Performance depends upon how well that job is done. A neglected gear case may wreck a set of gears. These, in turn, may punish an armature to failure. There are cases on record of repeated armature failures and changeouts until attention was called to defective gearing. When this was removed, the armature failures stopped.

You Reap What You Sow

The better you understand gearing, the more you respect it as a remarkably accurate and dependable piece of machinery. Give it the attention and care worthy of such machinery and it will give you long and faithful service. Even if neglected and abused, it continues to haul trains, but protests by kicking and shaking for a long time, everything connected with it. Yet gearing is long suffering and continues to warn you until it fails. If you take heed, you may have time to correct the trouble. Otherwise you can expect costly repairs, if not irreparable damage. Remember, you reap what you sow.

Test Rack Improves Locomotive Operation

(*Continued from page* 80)

8. Allow equipment to operate at this setting, under constant speed and constant load for about 20 minutes. The voltage and speed recorders should show straight lines.

9. Return all manual switches to the *off* position.

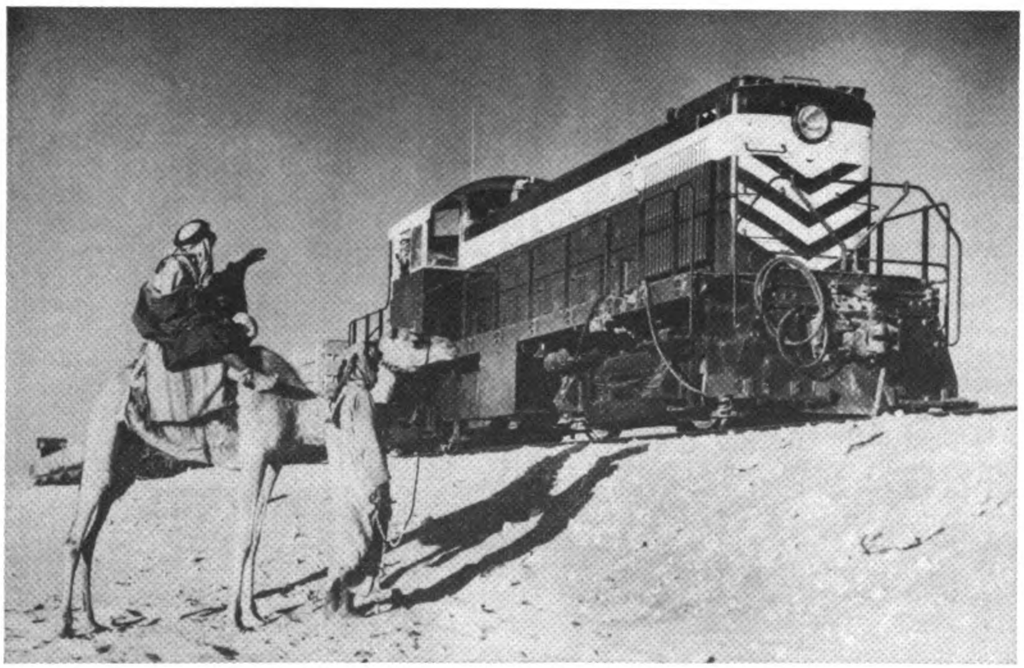
10. Turn the selector switch to the automatic position, starting the automatic cycle of speed and load changes described above. The pattern made by the recording voltmeter will indicate the condition of the voltage regulator.

Since this test rack was placed in service, regulators reported as defective by maintenance electricians, as well as regulators removed from diesel units undergoing heavy repairs, have been tested. These regulators have varied in age from nine years to two months with no record of any previous overhaul. Where regulators have shown poor performance, a thorough examination has revealed a wide variety of causes, including:

Open resistors.
Excessive play in linkage.
Excessive friction in the dash pot.
Worn pivots—both pins and bearings.
Lack of lubrication in torque motor bearings.
Pitted ball bearings in the torque motor.
Excessive end play in the torque motor shaft.
Grounded commutators.
Short circuited bars on commutators.
Grounded torque motor leads.
Open voltage-adjusting resistor.
Burned and pitted commutators.
Burned and pitted carbon rims.
A broken sector of the spring stud.
Grounds caused by dirt and carbon dust.
Faulty or loose electrical connections.

All regulators on the Coast Line system are to be serviced at the Waycross Shops. Regulators are completely disassembled and thoroughly cleaned. Any defective or worn parts are replaced. After assembly, they are placed on the test rack for a test of voltage stability and final adjustment of dash pots and linkage. Recording meter charts are marked with serial numbers of regulators and dates of test.

From the limited experience gained since this test rack was put in operation, the need for periodic reconditioning of voltage regulators has definitely been established. Experience may indicate that improvements can be added in the future, but to date, it has demonstrated that the effectiveness of shop overhaul of voltage regulators can only be proven by the final test for voltage stability made on the voltage regulator test rack.



An ancient mode of travel makes way for the modern in Saudi Arabia. Saudi Bedu and their camel (hp. unknown) wave to the engineer of an Alco-G.E. 1,000-hp. diesel-electric locomotive along the right-of-way of the Saudi Government Railroad near Hofuf, Saudi Arabia

Road Tests Show the Way To Better Locomotive Performance

Missouri-Kansas-Texas makes tests and studies of diesel locomotive performance which benefit both maintainers and designers

By C. H. Griffith,
chief electrical engineer, and
E. H. Pfeil,
assistant electrical engineer, Missouri-Kansas-Texas

CERTAIN difficulties have been experienced with diesel-electric locomotives on the Missouri-Kansas-Texas since the first road service units were placed in operation during 1947. With four different makes of locomotives, totaling 197 units, operating on 3,242 miles of railroad, furnishing the basis for the observations outlined, it can be assumed that similar difficulties have been prevalent on other railroads of comparable or greater size and diesel ownership. Any criticism offered should be considered constructive as it is given sincerely and with a hope that it may be of some benefit to manufacturers and users alike.

Main Generator Commutation

With one group of 21 road freight units starting service in June and July, 1947, we had a marked pattern of generator commutator bar discoloration followed by bar etching and flat spots which necessitated the resurfacing of the commutators on all units. This trouble developed when locomotives had been in service five to six months, and had operated approximately 80,000 miles. It is believed that it was caused by the improper functioning of automatic transition and possibly aggravated by commutator eccentricity.

Since the commutators were resurfaced and automatic transition modified so as to eliminate the cycling between series parallel shunt and parallel motor connections, we have experienced no similar trouble, the commutators now being in excellent condition after more than 700,000 miles of operation. Another modification made on these units was a change from closed circuit to open circuit transition. At the same time, current values for controlling backward transition were increased approximately 500 amp., thereby reducing the number of motor connection transfers—these changes, we think, were an aid in the elimination of commutator trouble.

On another group of 18 road freight units placed in service from November, 1948, to March, 1949, we had considerable trouble maintaining commutator surface due to threading and copper drag which tended to produce flashovers. These generators had commutators of the open riser type which were difficult to keep clean principally because the air drawn through the generator by the generator blower was laden with oily vapor collected in the air stream in passing over the top of the engine. These oily vapors made it difficult to keep the front and rear "V" ring string bands clean, thereby producing a condition which was contributory to flashovers.

These conditions have been improved by changing the grade of brush, reducing the number of brushes per holder to obtain greater current density and by blocking of some car body filters to change the air flow pattern in the engine room. In this case, we think the first two changes mentioned contributed most to relieving the trouble.

On a third group of 20 road freight units, placed in service during July, 1949, we are having quite a few flashovers which we attribute principally to oily vapors being blown through the main generator and collecting on brush holder insulators. These oily surfaces collect carbon dust, and thereby furnish a path to ground. These particular units are of the same manufacture as the first group mentioned, but are of a later design and model. In the modernization of these units, the manufacturer reduced the number of car body filters 33⅓ per cent and applied louvers which gave the locomotive a much better external appearance. The filters eliminated were at a location in the end of the car body where we have the major portion of our engine room air requirements; namely, engine air, generator blower, front traction motor blowers and air compressor. With the reduction in the number of filters, the restricted air flow through the louvers, and the revision of filter location, it is evident that some of the generator blower air must be supplied from the air stream passing over the top deck of the engine.

On one of these units, we recently had a fire in the main generator—a fire which might be classified a "trash" fire, as inspection disclosed the fact that the burning material was an accumulation of grease which had evidently been ignited by a severe flashover, and fanned by the generator blower. Fortunately, the damage was negligible as a maintainer who was riding the locomotive took the unit off the line, shut the engine down and extinguished the blaze with fire extinguishers. When the generator was removed and thoroughly cleaned with ground corn cobs, we found no serious damage—merely the burning of approximately one square inch of outer insulation on a compensating field connection.

These oil laden vapors produce a gummy condition in the brush holders which in turn is apt to set up ring fire and eventually a flashover between brush holders of opposite polarity.

From a paper presented before the South West Distict Meeting of the American Institute of Electrical Engineers held in St. Louis, Mo., April 15-17, 1952.

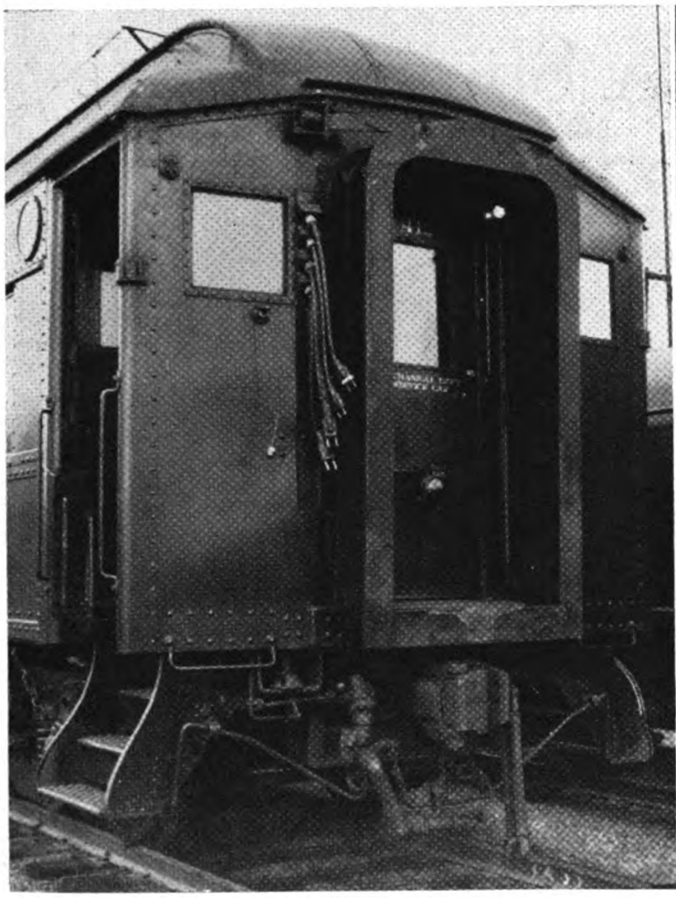


Fig. 1 (left)—Calibrated test leads with heavy duty connectors permanently attached to the test car. Fig. 2 (right)—Test cables connected between the test car and the locomotive

To alleviate these troubles, we have now initiated a program of installing six additional standard car body filters in each unit, located in the area of the maximum air demand.

With this particular type of locomotive, we are operating the main generators at greater temperatures than those of the older type, as a considerable quantity of air is being recirculated through the generator.

Switch Gear and Control Equipment

On one class of locomotive, we have had many locomotive unit failures due to poorly designed contacts on the switch used for the transfer of motor connections from power to braking. These contacts cannot be made trouble free with any reasonable amount of shop maintenance, and have been responsible for many train delays and tonnage reductions.

Another item that has caused much trouble from a maintenance standpoint is the design of interlock contacts. On one make of locomotive, trouble from interlock contacts has been negligible, while on a competitive make of locomotive, this very important item has been the cause of numerous delays and costly maintenance.

A third problem that has caused concern on the part of maintenance forces is the type of equipment used for transition control. On one make of locomotive, control is by use of an axle generator which transmits a wheel speed signal to three or more relay panels which control motor transfer switches. A special drive and test meter are required for satisfactory checking of this equipment. With all of this, maintenance is often reduced to guess work due to the fact that road operation is difficult in the shop.

As a contrast, equipment performing similar control functions on another make of locomotive has been reduced to three rather simple relays. Special equipment for testing in this case involves a small motor generator set and voltmeter. With this equipment, very few cases of trouble have been experienced that cannot be definitely corrected in the shop.

The point here is not to champion any one make of equipment, but to remind ourselves that from a railroad maintenance point-of-view, the simplest method of accomplishing a given result is generally the best. This, we believe, is true even though the final accuracy of the simpler method may not be as close as a more involved and costly method. Much help could also be given maintenance forces by the manufacturers in prompt correction of recognized faulty designs.

Control equipment on some locomotives is installed in such a compacted mass that it is almost impossible to reach some devices or terminals to clear faults which develop. These places are not necessarily inaccessible during the construction at the manufacturing plant, but are rendered so when the hood or housing is placed over them. If designing engineers had the responsibility for maintenance, we believe they would give more thought to the accessibility feature.

Traction Motors

On one particular make of traction motors, we find it necessary to grind commutators at 150,000 to 200,000-

Fig. 3—Test cabinet with two twin graphic instruments and telephone

mile intervals while on two competitive makes we do not have a similar condition. These commutators, when checked with a dial indicator, show variations up to 0.012 inch, and vary between the three brush tracks. Commutator surfaces show a series of flat spots which may span several bars and very seldom extend across the entire commutator face. The manufacturer attributes this condition to stall burns, but we are at a loss to understand why similar conditions are not prevalent on other makes of locomotives operated by the same personnel in identical service unless it is on account of differences in load control methods.

"On the Road" Testing

An all-steel passenger car, fitted by the railroad for testing diesel-electric locomotives, has an instrument or office room, sleeping accommodations for nine people, kitchen, dining room, and a room for the attendant.

The forward end of the car contains a cabinet, with desk attached, in which are mounted two twin graphic

instruments (generally operated at a chart speed of 12 in. per hr.), containing the following elements: (See Fig. 3)

Watt meter—for recording main generator output.

Speed recorder—operating from generator, belt-driven from car axle.

Voltmeter—for recording main generator voltage.

Ammeter—for recording traction motor current.

Each instrument is fitted with two chronograph pens, one on each being operated simultaneously by a push-button, and generally used for marking mile posts on the margin of the charts. Two of the other chronograph pens record service and emergency brake applications.

A telephone heat set and chest transmitter is located at the desk in front of the instruments and is used for communication with one or both cabs of the locomotive by the use of portable telephones.

Test Leads

Test leads, calibrated with the instruments are in two parts, and fitted with heavy duty connectors. The portions attached to the instruments are permanently installed in the car and lead out through the vestibule for convenient connection to the portion of the cables used on the locomotive. All road locomotives are fitted with openings in the nose section for the accommodation of the locomotive portion of the cables which are secured with strain relief bushings and special lock nuts. (See Figs. 1 and 2)

With these instruments we found an undesirable feature in generator control which caused the generator to operate at subnormal rating for seven and one-half minute periods during the process of making forward transition on traction motors. When this was brought to the attention of the manufacturer's representatives, we were told they had delivered large quantities of similar locomotives to larger roads and had never received similar complaints from them. This trouble was overcome by their engineers, but would probably have been passed unnoticed if we had not registered a complaint.

Correcting Cycling Trouble

In another case, we had trouble with cycling from transition 2 to 3 and back to 1. To correct this trouble the manufacturer's Engineering Department made a modification which was applied to all units of that class. At the completion of this modification, the performance had not been helped, but by continuing our tests with graphic instruments one of their engineers in the field solved the problem and eliminated the trouble.

On a recent lot of locomotives with 80-m.p.h. gearing, we found that we had a severe sagging in the horsepower curve at 50 to 55 m.p.h., whereas the design curve showed this break in the curve should not occur until we reached a speed of 69 m.p.h. As was the case with another make of locomotive, we were told that many similar units were sold to other roads, who made no complaints of this nature. The latest advice we have on this matter is that through some miscalculations in the Engineering Department, traction motor field shunting resistors of improper values were applied.

In our opinion, we have obtained invaluable information by road testing with graphic instruments in our test car and have detected shortcomings which could never have been found by load testing devices in the shop. Both types of testing are considered essential on our road.

We have always cooperated with manufacturers in test projects and feel that our findings have been beneficial to both of us, and the industry as a whole.

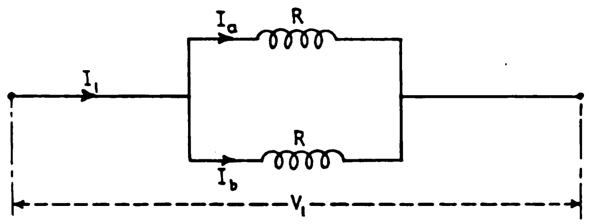
CONSULTING DEPARTMENT

Field Coils for Motors Of Different Voltage

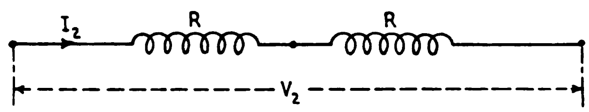
When two shunt motors have the same rating, and their voltages are in the ratio of 2:1, is it possible to use the same field coil for both machines?

Yes, if the coils are connected in series across the line in higher voltage machine, and in parallel across the line in the lower voltage machine. For example, assume that the machine is a 2-pole shunt motor.

Let the required ampere = turns = NI
Each field coil resistance = R
Each field coil turns = N
Voltage across line = $V_2 = 2V_1$
Total field loss, watts = P_f



Motor I



Motor 2

A. Field Calculation:

$$I = I_b = \frac{V_1}{R}$$

$$\text{and } I_2 = \frac{V_2}{2R}$$

$$\text{but } V_1 = \tfrac{1}{2} V_2$$

$$\text{thus } I_b = \frac{V_2}{2R} = I_2$$

$$\text{Then field } = NI = \frac{NV_2}{2R} = NI_2$$

B. Field Loss:

$$P_f = V_1 I_1$$
$$= V_1 2I^a$$
$$\text{but } I_f = I_2$$
$$\text{then } P = V_1 2 I_2$$
$$\text{likewise } V_1 = \tfrac{1}{2} V_2$$
so that
$$P_f = \frac{V_2}{2} \text{ x } 2I_2 = V_2 I_2$$

L. T. LOFORESE
Safety Car Heating and Lighting Company, Inc.

EDITORIALS

Cashing in on Actual Experience

Over the long period of years that the steam locomotive was the principal form of motive power on the railroads of this country there were efforts made by many groups acting either independently or as committees of established organizations to effect some degree of standardization of general design as well as the design of parts but steam power is passing out of existence in much the same form that it came in. The designs of steam locomotives reflected the ideas of individuals and groups on the many separate railroads that specified general designs and proportions adapted primarily to the service of the roads for which they were built.

Variations in ideas and differences in service requirements were probably responsible to a major degree in the now-forgotten development that enabled the steam locomotive, in its final form, to establish many records for performance and in economy of operation. Actually, too, the degree of standardization of many important steam locomotive parts was carried, to advantage, much farther than many realize. Standardization is always a worth-while project but if carried too far, it is possible, as one railroad man expressed it, to standardize some errors, too.

The diesel-electric locomotive came into the picture in almost the exactly opposite manner in that it was pretty well standardized from the beginning. Its success so far has proved that the major idea of design was sound and it is only now that the many millions of miles of service experience are beginning to show up some weaknesses of minor parts that it may be desirable to change. Constant contact between the railroad users and the service departments of the builders have resulted in many changes that are now reflected in greatly improved designs.

It is to be hoped that as the individual roads build up service experience with diesel-electric power they will move with caution before making or requesting too many changes to be made in existing types of units. There is no denying the fact that many roads are having troubles, large and small, with many of the parts of the modern locomotives. Some of these troubles may be corrected, in the long run, by more operating experience and some of them may, in the end, require definite changes in design of parts.

Fortunately, for the railroads, we have the benefit of etstablished organizations in the mechanical field which can be used as a clearing house for ideas. If the working committees of these groups do a good job of rounding up, from the experience of member roads, a catalog of the troubles that need correcting; find out from as many roads as possible what individual steps have been taken to correct the troubles and then apply the force of group experience and a united front in making intelligent suggestions as to desirable changes, it should be possible continually to improve motive power without unnecessary expense. The intelligent use by the roads of proper committee work in mechanical organizations is one opportunity that has not been fully explored. It is an opportunity to cash in on experience in a big way.

Commutators Need Seasoning, Too

Is the fact that of all the railroads using diesel-electric locomotives only four so far have seen fit to install six units of a modern design of commutator seasoning machine an indication that the majority of roads do not fully appreciate the possibility, by such means, of assuring longer and more efficient traction motor life?

The question may be asked if railroads really need a machine they have been generally getting along without since the advent of diesel motive power. An answer is found in the action of four large users of diesels which have considered it worth while to install the machines at a cost up to $20,000 each, evidently because of some difficulties being experienced with traction motor commutation. Another indication that present commutator performance leaves something to be desired, under the arduous conditions of locomotive service, is the action of the new A.A.R. Electrical Section of the Engineering and Mechanical Divisions in recently assigning a committee to study this subject.

Not all users and maintainers of diesel motive power realize the extent to which traction-motor armatures and commutators, made of different materials with widely varying coefficients of expansion, expand and contract under the repeated heating and cooling cycles to which they are subjected in normal operation. Without suitable "curing," or seasoning in advance, it is hardly reasonable to expect commutator segments to stay sufficiently concentric and properly alined to permit satisfactory brush action in picking up the electric current.

Commutator seasoning normally involves applying heat with a gas flame while armatures are revolving at maximum speed until a temperature of about 320 deg. F., is reached, then cooling and tightening. In some

instances, the period of revolution of the armature while heated varies from 45 to 60 min. and another hour is required for cooling, also at full speed. This operation may be repeated as many as six times before the commutator is ground, assuring smoothness and concentricity of the commutator bars within close limits, both hot and cold.

During manufacture, commutator seasoning is a regular practice, and by the same token it would appear that it ought to be done every time the commutator is disturbed, whether by the manufacturer or the railroad.

The present general railway practice of simply baking and tightening commutators without the application of speed may be entirely adequate for small motors and especially those operating under relatively stable conditions of load and vibration, but the service demanded of diesel locomotive traction motors is an entirely different story requiring the best techniques both in new construction and repairs.

Heat or Vibration

Much effort is spent teaching—or in some cases trying to teach—railroad operators that overloading of diesel traction motors takes the life out of the insulation. The motors may take it for one trip, or thirteen or fourteen, and then fail on the fifteenth. Then the apparently logical question is, "Why did they fail on this trip when they worked all right on the other fourteen?"

Gradually, this is born in on the consciousness of the operators and then, if they happen to feel kindly toward the maintainers, they may cut off a couple of cars. Perhaps then trouble continues and it is discovered that the high temperatures were not caused by too many cars on a grade but rather by too many starts and stops in restricted territory. If it is passenger service, it may be found that the motors get hot at high speeds and this is contrary to what the operators have been told should never happen. Motors are supposed to get hot only at low speeds when current values are high. It is a hard school—often harder on the teachers than the taught.

But in recent years a high percentage of motor failures have occured when there was no evidence of overheating. There are insulation failures and broken coils, the destruction sometimes being so complete that the cause is obscured. However, it is becoming more and more evident that at least a considerable part of the failures were developed by vibration.

Self-respecting manufacturers of precision gears, with pride in their product, feel they are being imposed upon when they are required to put 500 hp. through an overhung pinion such as must be used on a diesel traction motor. The shaft must flex enough to cause appreciable misalignment of the gear and pinion. Then, if wear in the motor support bearing is allowed to become excessive and the grease gets too thick or leaks out of the gear case and steps are worn on the gear teeth, long-departed gear designers turn over in their graves.

The result is that the entire locomotive and especially the motors come in for an awful beating and having failed, get blamed for being weaklings. Some excellent information on how to avoid such calamities is contained in Chapter 9 of the "How to Keep 'Em Rolling" series in the Electrical Section of this issue. It will not correct circumstances, and it will not tell a railroad how much it can afford to take out of a locomotive in order to get more tonnage over the road, but it will help.

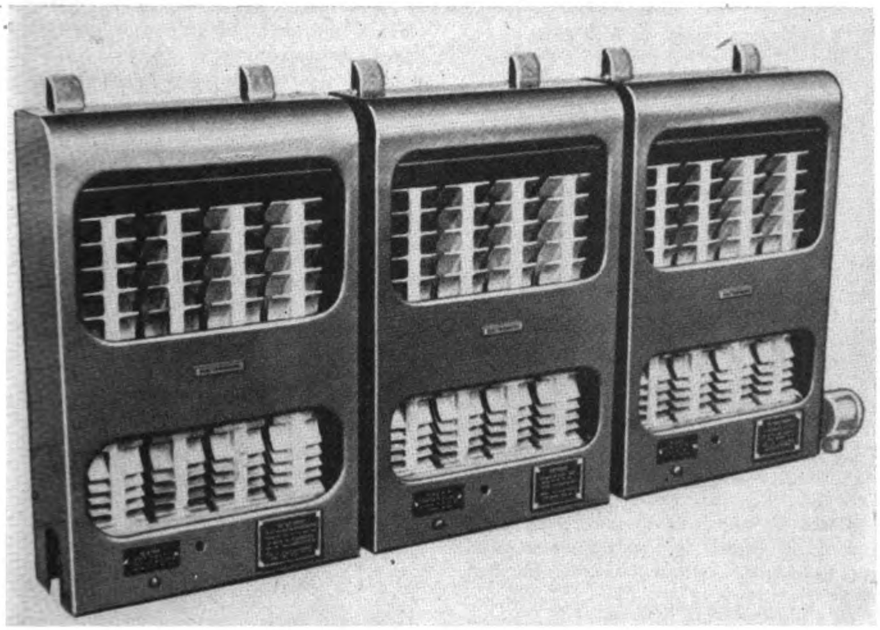
New Books

FORGING AND FORMING METALS. *By S. E. Rusinoff, M. E. Published by the American Technical Society, Drexel avenue at 58th street, Chicago 37. 279 pages, 5½ in. x 8¼ in., illustrated. Price, $3.95.*

Described in separate units in the sixteen chapters of this book are impact forging, press forging, upset forging, extrusion, heat treatment of forgings, cleaning and finishing of forgings, inspection of forgings, safety in the forge shop, designing a forged part, designing dies and tools, metal quality, and the selection of a metal for forging. Included also are a Glossary of Forging Terms and a chapter entitled "Standard Practices and Tolerances for Impression Die Forgings." The usages and specifications set forth in these sections are in accordance with those adopted by the Drop Forging Association. At the end of each chapter is a set of review questions, and at the end of the text an Appendix of Useful Tables and a selective bibliography. The book is profusely illustrated with photographs and line drawings.

ALCOA AN AMERICAN ENTERPRISE. *By Charles C. Carr. Published by Rinehart & Co., Inc., New York. 292 pages, 5½ in. by 9¼ in., illustrated. Price, $3.50.*

The story of Alcoa is presented as "a case history of a business which came to fruition under our American system." The author was for many years director of public relations for the Aluminum Company of America. All phases of Alcoa's history, whether or not they involved controversy, are included. The foreword discusses how the electrolytic fission of aluminum oxide by Charles Martin Hall in 1886 brought about the aluminum industry of the United States, spearheaded by the Pittsburgh Reduction Company. Chapter I is the story of Hall, interwoven with the name of Paul L. T. Heroult who influenced aluminum history in Europe through his inventions and whose process at times affected the American scene. Chapter 2 tells of Alcoa's Beginnings in July 1888 as the Pittsburgh "Aluminium" Company. A few weeks later the corporate name was changed to the Pittsburgh Reduction Company, and within a year the company had adopted "aluminum," the present American spelling of the word. In 1907 the company became the Aluminum Company of America. Succeeding chapters discuss the early struggles for patent rights, for financial backing and for consumer markets; the Anti-Trust Case; water power; research, etc. A chapter is also devoted to the part the Aluminum Company plays in the development of magnesium as a useful light metal.



Convection Type Explosion-proof Heater

Designed for use in atmospheres containing gasoline, petroleum, naptha, acetone, benzol, lacquer, solvent vapors and natural gas, the 6,000 watt Electromode heater, made by the Electromode Corp., Rochester 5, N.Y., is approved by the Underwriters' Laboratories for use in Class 1, Group D hazardous locations.

Typical users are industries where flamable gases, mixtures, or highly flamable substances are manufactured, handled or stored in other than their original containers. It has found application in pump, valve, and meter houses, and personnel warming shelters.

Its safety-grid heating element consists of a nickel chromium resistor wire, insulated and sheathed in a seamless metal tubing and is embedded in a one-piece finned aluminum casting. The aluminum grid remains at a low operating temperature, but has high thermal conductivity. It will not rust or corrode and there are no liquids to freeze-up or run dry.

These explosion-proof heaters are made in three models with ratings of 2,000, 4,000 and 6,000 designated as models CX-2, CX-4 and CX-6, respectively.

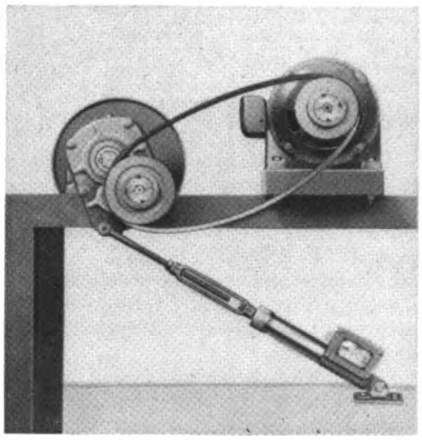
Speed Reducer Overload Release

An overload release for the Dodge Torque-Arm speed reducer, which provides protection for driven machines, motors and the speed reducer itself, has been developed by the Dodge Manufacturing Corp., Mishawaka, Ind.

The product has been named the Tri-Matic overload release and operates both mechanically and electrically to loosen the belts, cut off the current and activate a warning bell, siren or light.

Pressure exerted by an excessive load causes a piston to move lengthwise through the unit. This movement loosens belt and turns off current simultaneously. The warning system is hooked up to micro switch.

The device is calibrated for adjustment to the load conditions of any job. It can be set to act at any desired load up to the reducer's maximum capacity. To reset the unit after it has been tripped, it is easy to pull the speed reducer back manually into position. This automatically cocks the overload release mechanism.



Blind Rivet

No heating, no bucking and no special tools are necessary on blind riveting operations with the introduction of the Pax Speedy Rivet, a product of Rail-Air Equipment Company, Los Angeles 29.

For insertion, only two operations are required: insert the rivet and drive the pin with an ordinary mechanic's hammer.

The devices can be used for riveting all types of framing, whether channel section, angular, tubular etc. that are supported by framing members. Railroad passenger cars can be reroofed without removing interior panels and fixtures thereby greatly reducing "out-of-service" days.

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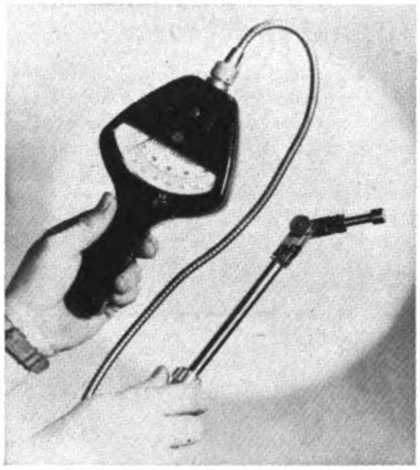


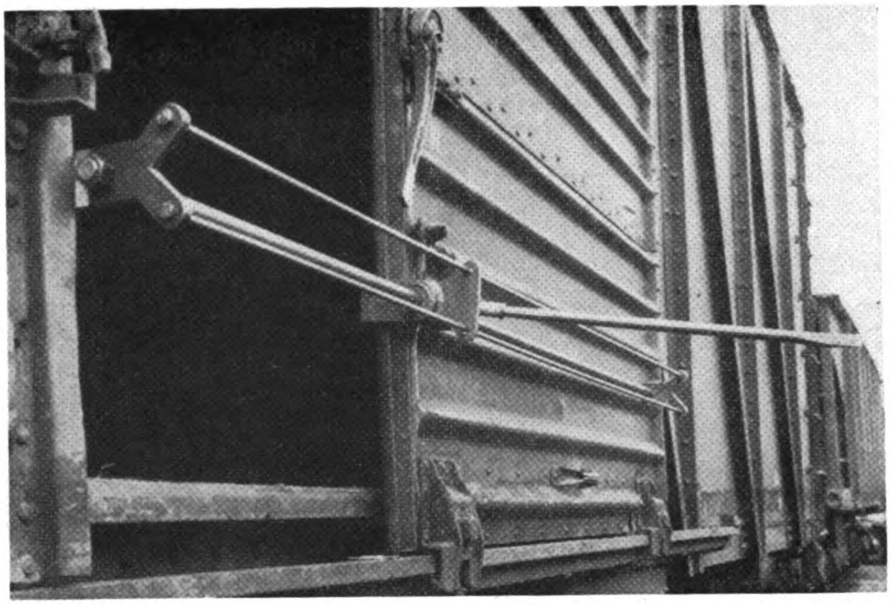
Hand Pyrometer With Two Ranges

A hand pyrometer with two scale ranges for the rapid and convenient measurement of surface, liquid, gas and molten-metal temperatures has been announced by the General Electric Meter and Instrument Department.

Designated as the Type FH-1, the new pyrometer is especially useful where a temperature detector does not need to be installed permanently. Its two scale ranges are 0-500 deg. F. and 0-1,500 deg. F., and the change from one scale to the other is accomplished by the flick of a switch.

Three interchangeable tips include a surface tip, an immersion tip for liquids and molten metals, and a two-prong contact tip. These tips, together with flexible and rigid extension arms, can be easily changed.

The automatic cold-junction compensation feature of the pyrometer eliminates the need for manual adjustment of the pointer for atmosphere. Readings can be made directly from either scale of the instrument since no calculations or corrections are needed.

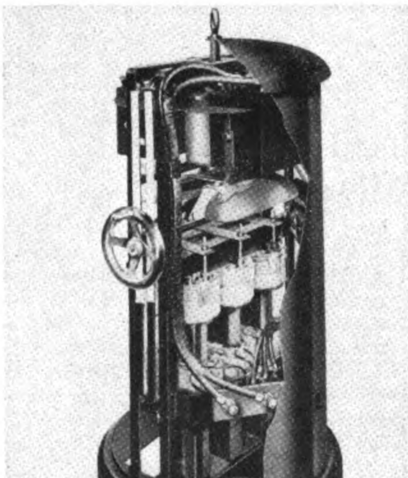


Mechanical Door Opener and Closer

With the idea of providing a safe and simple method of opening and closing freight box car doors, Penco Engineering Company, 25 California Street, San Francisco 11, has marketed the E-Z-Way mechanical door opener and closer.

This device can be inserted and pressure applied up to 4,000 lb. at any height in the car doorway. It is light in weight, only 34 lb., and can be carried and operated by one man. It does not violate any of the safety appliance laws as it is not necessary to attach to any part of a car.

This unit consists of a short bar which fits into a ratchet housing. When swung back and forth, it slides the door open or closes it. The device will not jerk car doors off runners and cause the door to fall on an operator.



Rectifier Type D.C. Welder

A heavy duty direct current welding machine has been put on the market by the A. O. Smith Corp., Milwaukee, Wis. The machine is designed for all industrial uses, where d.c. welding is required.

Extensive field testing has shown the new unit to be free of stack failure. This is accomplished by directing a high velocity downdraft of cool air over the rectifier stacks before passing this air through other parts of the machine. The blast is expelled at the base of the welder. This assures proper cooling and promotes internal machine cleanliness.

All of the principal construction features of its heavy-duty a.c. welder are retained in the d.c. unit. Among these are the case-diameter fan and wind tunnel design to assure adequate, efficient air flow over all energized parts. The primary coils are raised and lowered on ball bearing jacks. The machine is available in 200-, 300- and 400-amp. ratings.

◆

Metal Parts Cleaner

A cleaning solution which can be used for the removal of carbonized oil and gums from diesel engine parts has been announced by the Magnus Chemical Co., Garwood, N. J. Known as Magnus 751, the manufacturer also recommends its use for cleaning corburetors, fuel pumps, pistons, rocker arm assemblies, rear and transmission parts, etc.

It is claimed to be safe for all metals, not attacking, pitting, or marring aluminum alloys, bearing metals, cadmium, solder or any other soft metal. The cleaner can be used in either hot or cold solution and is followed by a simple cold water rinse after the cleaning period. It is non-inflammable.

Where a large volume of parts has to be cleaned regularly, this cleaner works best when utilized in the Magnus Aja-Dip cleaner machine. In this unit, agitation speeds up the cleaning action. All traces of deposits are removed, making hand brushing unnecessary.

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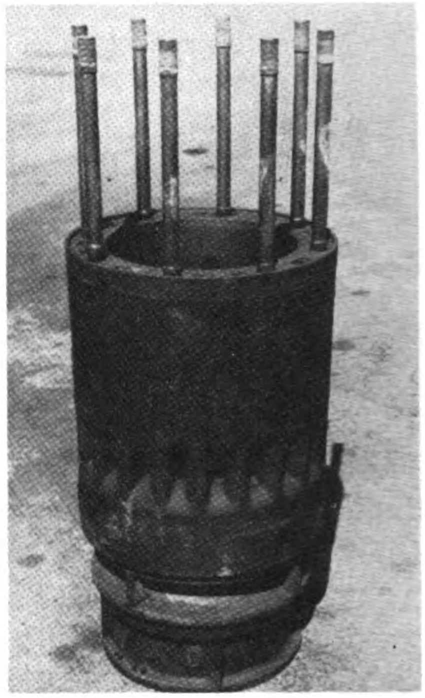

Lubrication for Diesel Liners

A bonded to metal lubrication process termed Lube-Lok, made and licensed by its manufacturer the Electrofilm Corp., North Hollywood, Calif., is being applied to diesel liners for two Class I railroads.

Recent tests on one of the Class I roads showed that the life of the processed liners was increased approximately 85,000 miles beyond normal service.

For the convenience of industry and users, nation-wide processing plants have been established in the following cities: Newark, Detroit, Ravenna and Dayton, Ohio, Chicago, St. Louis, Minneapolis, Colorado Springs, San Diego, Seattle and Los Angeles.

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High Temperature Aluminum Paint

An aluminum paint which the manufacturer claims will withstand extreme heat as high as 1,200 deg. F. has been an-

(Continued on page 120)

NEWS

N.Y. RR Club Announces Essay Contest Winners

THE New York Railroad Club has announced the winners in its 1951 Roy V. Wright Memorial Essay Contest as follows:

The $500 award to W. J. Cavanagh, a member of the traffic department of the United States Steel Export Company, New York.

Awards of $100 each to: Robert L. Banks, transportation consultant, National Military Establishment, Hyattsville, Md.; Raymond E. Hannon, research assistant, Canadian Pacific, Montreal; Charles Harwood, Jr., research economist, New Rochelle, N. Y.; Paul K. Lambert, traffic department, General Refractories Company, Philadelphia; Robert A. Patterson, traffic representative, Long Island Rail Road, East Williston, N. Y.; Stuart W. Rider, Jr., assistant solicitor, Chicago, Milwaukee, St. Paul & Pacific, Minneapolis; R. E. Rose, assistant chief rate clerk, passenger traffic department, Canadian National, Winnipeg; Francis P. Ryan, traffic department, Eastman Kodak Company, Rochester, N. Y.; E. H. Spencer, assistant supervisor of traffic, Fairless Works, U. S. Steel Company, Morrisville, Pa.; and Dr. G. Lloyd Wilson, professor of transportation, Wharton School, University of Pennsylvania, Philadelphia.

Mr. Cavanagh and six of the $100 prize winners (Messrs. Banks, Harwood, Lambert, Rider, Ryan and Dr. Wilson) wrote on the assigned subject—"Essential Provisions of an Adequate National Transportation Policy." The essays submitted by Mr. Patterson, Mr. Rose and Mr. Hannon were based on the theme "How to Make Passenger Traffic Pay." Mr. Spencer's subject was "Agreed Rates."

A.A.R. Turns Down Unicel Car—Temporarily

THE Mechanical Division of the Association of American Railroads has—temporarily at least—not approved the Pressed Steel Car Company's Unicel combination refrigerator-box car of cellular laminated wooden construction.

The car was the major subject of a meeting of the division's General Committee which, in a resolution, considered the car "a step backward primarily because of experience with wood cars in the past" and because of the difference in maintenance methods—and maintenance expense—it would entail. The committee pointed out that: "Woodworking machinery on all railroads has been practically eliminated or so severely curtailed that maintenance of wood cars would introduce added capital expenditures."

The committee agreed that the car, in new condition, had more than adequate strength. But it questioned that the car would retain that strength over a full period of service life. That, the committee felt, was something to which only time would reveal the answer.

The committee's action, however, does not restrict railroads from buying the car for use on their own lines.

John I. Snyder, Jr., president of the Pressed Steel Car Company, announced on April 10 that it was the company's aim to prove "Unicel" to the satisfaction of all potential users for unrestricted interchange service on the nation's railroads.

Mr. Snyder disclosed that while the A.A.R. had no objections to individual railroads using the "Unicel" on their own lines, the association had recommended that "no cars of this type be built for interchange service except in the event of a national emergency which would restrict steel in freight car building . . . because maintenance of such cars would necessitate additional capital expenditures."

Stressing Unicel's steel-saving advan-

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

Item No.		Month of December 1951	Month of December 1950	12 months ended with December 1951	12 months ended with December 1950
	FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)				
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	20,994	28,693	295,426	346,515
3-06	Total, Diesel-electric	24,809	20,025	273,807	211,799
3-07	Total, electric	760	793	9,695	9,880
3-04	Total, locomotive-miles	46,563	49,511	578,950	568,260
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,584	1,709	20,601	19,633
4-06	Empty, total	881	812	10,602	10,139
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	36,248	47,097	519,089	577,555
6-02	Total in oil-burning steam locomotive trains	8,850	12,370	139,728	154,174
6-03	Total in Diesel-electric locomotive trains	66,202	55,102	762,500	598,910
6-04	Total in electric locomotive trains	2,023	2,122	26,451	26,351
6-06	Total in all trains	113,331	116,697	1,447,914	1,357,302
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.04	1.05	1.04	1.05
10-02	Loaded freight car-miles	37.70	38.60	39.50	38.60
10-03	Empty freight car-miles	20.90	18.30	20.30	19.90
10-04	Total freight car-miles (excluding caboose)	58.60	56.90	59.80	58.50
10-05	Gross ton-miles (excluding locomotive and tender)	2,693	2,634	2,774	2,669
10-06	Net ton-miles	1,251	1,233	1,301	1,224
12	Net ton-miles per loaded car-mile (M-211)	33.20	32.00	33.00	31.70
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	64.30	67.80	66.00	65.90
14	Averages per train hour (M-211):				
14-01	Train miles	17.10	16.60	17.00	16.80
14-02	Gross ton-miles (excluding locomotive and tender)	45,525	43,139	46,424	44,352
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	42.70	44.40	46.00	45.20
14-02	All	40.70	42.30	43.80	42.50
15	Average net ton-miles per freight car-day (M-240)	871	915	954	888
17	Per cent of home cars of total freight cars on the line (M-240)	40.80	35.90	37.50	40.80
	PASSENGER SERVICE (DATA FROM I.C.C. M-213)				
3	Road motive-power miles (000):				
3-05	Steam	9,935	13,139	119,382	141,521
3-06	Diesel-electric	17,989	15,948	198,101	176,722
3-07	Electric	1,782	1,780	19,548	19,385
3-04	Total	29,706	30,867	337,031	337,629
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	295,305	302,159	3,293,157	3,257,835
4-09	Total in coal-burning steam locomotive trains	54,382	74,086	629,385	740,281
4-10	Total in oil-burning steam locomotive trains	33,005	39,271	388,031	442,711
4-11	Total in Diesel-electric locomotive trains	188,657	170,209	2,065,563	1,866,810
12	Total car-miles per train-miles	9.87	9.71	9.61	9.47
	YARD SERVICE (DATA FROM I.C.C. M-215)				
1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	1,025	1,436	14,179	17,101
1-02	Steam, oil-burning	192	266	2,796	3,023
1-03	Diesel-electric[1]	3,180	2,850	35,736	30,441
1-06	Total	4,421	4,580	53,015*	50,894
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	44	67	540	701
2-02	Steam, oil-burning	13	15	156	164
2-03	Diesel-electric[1]	280	262	2,945	2,776
2-06	Total	373	381	4,045	4,054
3	Hours per yard locomotive-day:				
3-01	Steam	7.30	8.50	7.80	8.10
3-02	Diesel-electric	17.10	17.90	17.20	17.50
3-05	Serviceable	14.40	14.70	14.40	14.20
3-06	All locomotives (serviceable, unserviceable and stored)	12.50	12.70	12.40	12.10
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.92	1.84	1.78	1.79
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.78	0.78	0.76	0.77

[1] Excludes B and trailing A units.

tages of "between 11 to 20 tons per car," he emphasized that "the steel shortage has grown more acute since 'Unicel' was first proposed and our national steel emergency situation may be upon us sooner than most Americans think. Many authorities say it is here now.

"Until sufficient new steel-making facilities begin turning out the vast quantities of steel America now requires, we will continue to have a serious freight-car shortage weakening both the nation's transportation system, of which it is such a vital part, and our defense rearmament program. Steel alone won't answer the freight-car shortage. For car builders are simply not getting the necessary amounts of steel in proper balance. Besides, 'Unicel' cars can be built 20 per cent faster than conventional steel freight cars."

Pressed Steel Car will continue with development work in applying the "Unicel" material and principle to fields other than railroads, Mr. Snyder said, adding: "To date we have made Unicel truck trailers, shipping containers and houses."

Oil and Gas Power Conference

THE 24TH annual conference and exhibit of the Oil and Gas Power Division of the American Society of Mechanical Engineers will be held in the Statler Hotel, Buffalo, N. Y., June 23-27. Subjects for the technical sessions will include papers on engine lubrication, spark ignition gas engines, crankshaft design problems and diesel engine power plants. The latter session will embrace three subjects: diesel vs. steam power plants, the place of diesel engines in the R.E.A. program, and vapor phase cooling. There will also be a panel discussion on engines of high specific output, subdivided under design improvements in high output diesel engines both from the navy and industrial viewpoints; valves, pistons, piston inserts and piston rings, and a special view of the piston sealing problem.

The exhibit will represent a large number of engine manufacturers, accessories, plant equipment, and services. Time will also be available for the inspection of plants in uffalo and vicinity, including the Worthington Corporation, Niagara hydro plant, Van der Horst Corporation of America at Olean, and others.

Cleveland Car Supervisors Elect Officers

THE Cleveland Car Department Supervisors Association, which was organized in December 1950 to promote increased efficiency in railway car handling and holds meetings the second Wednesday of each month at the Belmont Hotel, Cleveland, has elected the following new officers for the fiscal year: president, A. C. Bender, joint supervisor car inspectors, all lines, Cleveland; first vice-president, E. J. Zepp, general car foreman, Nickel Plate, Cleveland; second vice-president, J. J. Matchulat, foreman car repairs, Pennsylvania, Cleveland; secretary, N. F. Lorenz, car foreman, Nickel Plate, Cleveland; treasurer, J. C. Novy, car foreman, Erie, Cleveland.

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE APRIL ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horse-power*	*Service*	*Builder*
Atchison, Topeka & Santa Fe	60[1]	....		Various builders
Bangor & Aroostook	4[2]	1,500	General purpose	Electro-Motive
Canadian National	4[3]	....	Work-train service	Canadian Loco.
Central of Georgia	6[4]	1,200	Switching	Electro-Motive
Chesapeake & Ohio	17[5]	1,500	Road switching	Electro-Motive
Chicago & North Western	2A[6]	2,250	Passenger	Electro-Motive
	4B[6]	1,500	Freight	Electro-Motive
	50[6]	1,500	Road switching	Electro-Motive
	5[6]	1,200	Switching	Electro-Motive
	1[6]	800	Switching	Electro-Motive
	8[6]	1,600	Road switching	Fairbanks, Morse
	4[6]	1,200	Switching	Fairbanks, Morse
	11[6]	1,600	Road switching	Alco-G. E.
	4[6]	1,200	Switching	Baldwin-Lima-Hamilton
	1[6]	1,600	Road switching	Baldwin-Lima-Hamilton
Georgia	1[7]	1,500	General purpose	Electro-Motive
Lehigh Valley	3[8]	800	Road and yard switching	Electro-Motive
Missouri-Kansas-Texas	5[9]	1,200	Switching	Baldwin-Lima-Hamilton
	4[9]	1,600	Road switching	Baldwin-Lima-Hamilton
	6[9]	1,500	Road switching	Electro-Motive
Reserve Mining Co.	2	800	Switching	Electro-Motive
Southern Pacific	188[10]	....		Alco-G. E. Baldwin-Lima-Hamilton Electro-Motive Fairbanks, Morse
Wabash	8[11]	1,500	Freight	Electro-Motive
	5[11]	1,500	General purpose	Electro-Motive

DIESEL-ELECTRIC LOCOMOTIVE INQUIRIES

	No. of units	*Horse-power*	
Transportation Corps	8[12]	....	
	1[12]	....	

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Gulf, Mobile & Ohio	200[13]	Pulpwood	Company shops
St. Louis Refrigerator Car Co.	200[14]	40-ton refrigerator	Pressed Steel Car
Southern	1,500	70-ton gondola	Pullman-Standard
	1,750	70-ton hoppers	American Car & Fdry.
Western Pacific	100[15]	70-ton gondola	Greenville Steel Car

PASSENGER-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Grand Trunk Western	5[16]	Coaches	Pullman-Standard
Long Island	20[17]	M. U.	Pullman-Standard

[1] Details of order not disclosed. If allocations of materials—especially steel—will permit, the Santa Fe will spend a total of $73 million for new equipment and other improvements during 1952. Of this total about $53 million will go for new freight cars and diesel locomotives. A statement contained in the road's recently released annual report said that allocations may restrict the total expenditures to some amount between $65 million and $70 million and make it necessary to carry a part of this program over into 1953.

[2] Estimated cost, $650,000. Delivery scheduled for September.

[3] To be operated on a new 147-mile development line under construction in northern Manitoba. Because winter temperatures there drop to 60 deg. below zero, the diesels will be equipped with specially designed heaters for maintaining fuel oil in a liquid state and heating engine cabs and the circulating water systems. They will be fitted also with fuel filling pumps to take on fuel from barrels along the right-of-way.

[4] Each to cost an estimated $106,000.

[5] Each to cost $167,391. Delivery expected not later than March 1953.

[6] Five of the Electro-Motive 1,500-hp. road switching units and three of the Alco-G.E. 1,600-hp. road switching units are for the C. St.P. M. & O. Deliveries expected to begin in the second quarter of 1952 and to be completed during the fourth quarter.

[7] Estimated cost, $150,656. Delivery scheduled for August.

[8] To cost $95,000 each. Delivery scheduled for the last quarter of 1952.

[9] Deliveries expected to begin in May and be completed in September.

[10] A breakdown of the order and builders is not available.

[11] Delivery scheduled for September.

[12] Eight units to be 80-ton; one, 120-ton. Six, including the latter, are for the Navy and the other three for the Marine Corps.

[13] Approximate cost, $1,125.000.

[14] St. Louis Refrigerator has also ordered 100 sets of car parts for the same type of cars to be constructed in its own shops.

[15] To be equipped with roller bearings. Estimated cost, $761,000. Delivery expected in the fourth quarter of 1952.

[16] To cost $119,800 each. Delivery expected in September.

[17] These single-deck cars will cost approximately $2,200,000. "Under the contract with manufacturer," according to William Wyer, trustee for the Long Island, the road "can later increase the number of cars ordered and obtain the benefit of quantity price on the entire order, if studies now under way indicate that this is desirable." Mr. Wyer added, "These studies will either recommend purchase of additional new cars or extensive rehabilitation of existing equipment."

NOTES:

New York Central.—The N.Y.C. is undertaking a series of improvements to its streamline sleeping cars, according to Gustav Metzman, president. The improved cars will be used together to obtain maximum riding benefits. Work is under way in the road's own shops and in those of the Pullman-Standard Car Manufacturing Company, with the first complete improved trains expected to go into operation late this spring, Mr. Metzman said. The initial phase of the program involves changes to 76 cars. Among the many interior changes are a newly developed starter for fluorescent lights to insure instant response and redesign of room air-conditioning apparatus. Other changes are latest-type shock absorbers to cushion lateral and vertical action; improved swing hanger connection in combination with rubber coil springs of circular design to produce smoother lateral action; noise reduction by redesigning ends of cars and incorporating special rubber springs in coupler support arrangements. Mechanical changes include refinement of power generating equipment; devices to prevent wheels from sliding; and improved lubrication of journal roller bearings.

Mechanical Division Meeting at Frisco June 24-26

The Terrace Ball Room of the Fairmount Hotel, San Francisco, has been chosen for the sessions of the A.A.R. Mechanical Division convention to be held June 24, 25, and 26. Presentation of committee reports will be limited to a brief summary of their principal features. It is hoped, however, that the representatives of the railroads, car and locomotive builders, supply companies, etc., planning to attend will review the reports carefully in advance and be prepared with memoranda for a thorough discussion of each.

The program for each of the three days is as follows. The time given is California Daylight Saving Time.

TUESDAY, JUNE 24
10 A. M.

Address by D. J. Russell, president, Southern Pacific
Address by W. J. Patterson, member, Interstate Commerce Commission
Address by B. M. Brown (chairman), general superintendent motive power, Southern Pacific
Action on Minutes of 1951 annual meeting
Appointment of Committees on Subjects, Resolutions, etc.
Unfinished business
New business
Report of General Committee
Report of Nominating Committee
Discussion of reports on:
- Locomotive Construction:
  - Steam and Electric Locomotives Section
  - Diesel Locomotive Section
  - Gas-Turbine Locomotive Section
- Axle and Crank-Pin Research
- Safety Appliances
- Passenger-Car Specifications

WEDNESDAY, JUNE 25
9:30 A. M.

Address by E. H. Davidson, director, Bureau of Locomotive Inspection, I.C.C.
Address by L. L. Adams, manager—transportation planning, United States Steel Corporation
Discussion of reports on:
- Brakes and Brake Equipment
- Geared Hand Brakes
- Loading Rules
- Forest Products Loading (Special Committee)
- Specifications for Materials
- Couplers and Draft Gears
- Arbitration
- Prices for Labor and Materials
- Lubrication of Cars and Locomotives
- Development of Hot-Box Alarm Devices

THURSDAY, JUNE 26
9:30 A. M.

Discussion of reports on:
- Tank Cars
- Wheels
- Car Construction

Election of members of General Committee and Committee on Nominations
Report of Committee on Resolutions

SUMMARY OF MONTHLY HOT BOX REPORTS

Month	Foreign system and freight car Mileage (total)	Cars set off between division terminals account hot boxes: System	Foreign	Total	Miles per hot box car set off between division terminals
July, 1950	2,745,932,894	——	——	23,957	114,619
August, 1950	2,937,455,020	7,422	15,490	22,912	128,206
September, 1950	2,974,297,739	6,541	12,881	19,422	153,141
October, 1950	3,165,997,915	4,343	8,935	13,278	238,439
November, 1950	2,868,871,913	2,536	5,331	7,867	364,672
December, 1950	2,813,042,212	2,278	5,968	8,246	341,140
January, 1951	2,840,847,511	2,870	8,436	11,306	251,269
February, 1951	2,425,226,454	4,528	14,063	18,591	130,452
March, 1951	3,063,173,942	3,667	10,078	13,745	222,857
April, 1951	2,996,562,763	3,702	8,914	12,616	237,521
May, 1951	3,013,634,782	5,631	13,737	19,368	155,599
June, 1951	2,874,873,495	7,074	15,376	22,450	128,057
July, 1951	2,768,920,095	8,886	18,823	27,709	99,929
August, 1951	3,009,371,111	9,023	19,092	28,115	107,038
September, 1951	2,925,570,545	6,472	13,565	20,037	146,008
October, 1951	3,116,490,095	4,131	9,053	13,184	236,384
November, 1951	2,939,503,144	2,022	4,405	6,427	457,368
December, 1951	2,752,316,133	2,130	5,398	7,528	365,611

J. D. Conway Dies

JOHN D. CONWAY, secretary of the Railway Club of Pittsburgh and secretary-treasurer of the Railway Supply Manufacturers' Association, died on March 31. Mr. Conway was 88 years old. He entered railway service in 1881 as a telegraph operator for the Cleveland & Pittsburgh (now a part of the Pennsylvania) and was subsequently engaged as a telegraph operator for the

J. D. Conway

Pittsburgh & Lake Erie, and as clerk and chief clerk, motive power department, of the P. & L. E. He became secretary-treasurer of the Railway Club of Pittsburgh upon its organization in 1901 and secretary in 1918. In 1910 he was appointed secretary-treasurer of the Railway Supply Manufacturers Association, and served as chairman of the Pittsburgh Section from 1920 to 1927.

Nickel Conservation Research

CONSERVATION of vitally needed nickel and chromium in heat-resistant castings is the objective of a research project announced by the Alloy Casting Institute of Mineola, N. Y. From knowledge of the iron-chromium-nickel alloy system and field experience, casting metallurgists selected an alloy containing 21 per cent chromium and 9 per cent nickel, designated as the HF type, as the material most likely to provide the combination of strength and corrosion resistance required for "intermediate-temperature" (900-1,400 deg. F.) service. Tests to date indicate that this alloy offers a promising solution to the requirements of such service.

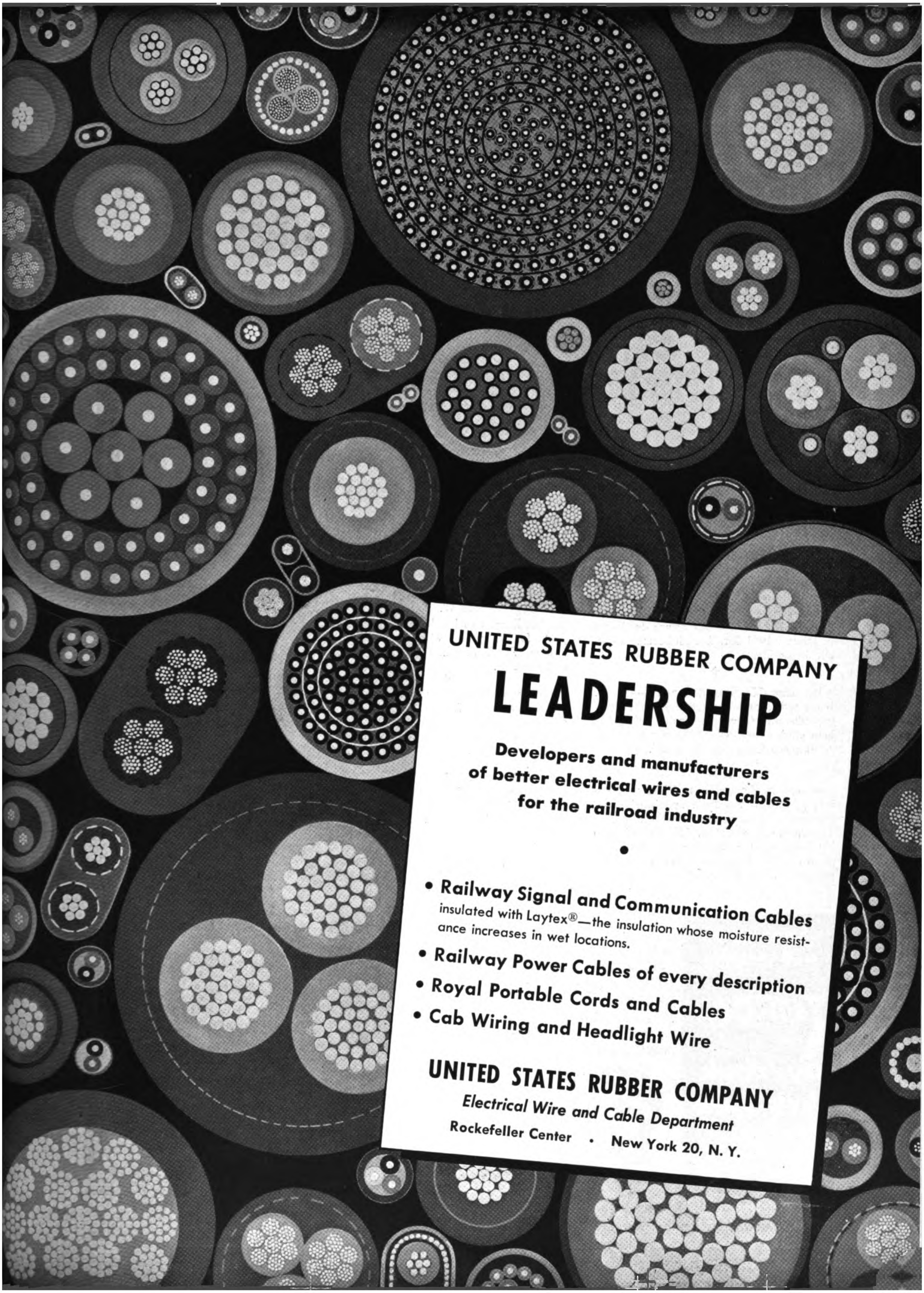
The team at the Battelle Memorial Institute where this research has been concentrated is now investigating a series of fourteen compositions within the HF alloy specification range to determine which compositions will offer optimum mechanical properties at elevated temperatures.

Wrought stainless steels containing about 18 per cent chromium and 8 per cent nickel have considerably less high-temperature strength than the cast alloys of the 25 per cent chromium-12 per cent nickel and the 35 per cent nickel-15 per cent chromium types. However, this is not true in cast alloys. Tests now being made indicate the cast HF material to have strength properties comparable to higher alloyed cast grades at these intermediate temperatures. This situation points up the necessity for using the A.C.I. alloy designations in ordering castings, rather than the A.I.S.I. type numbers (302, 304, etc.) which are associated with wrought materials only.

Steel Founders' Society Confers Honor Awards

NATIONAL medal awards for outstanding leadership in the steel casting industry were awarded by the Steel Founders' Society of America at its fiftieth annual meeting held in Chicago recently.

James Suttie, vice-president of American Steel Foundries, received the Lorenz Memorial gold medal, the society's top award. The organization's Technical and Operating gold medal for 1951 was awarded to Luther A. Kleber, vice-president in charge of manufacturing of the General Steel Casting Corporation. Harold H. Johnson, chief metallurgist at the Sharon, Pa., plant of the National Malleable & Steel Castings Co., received the annual Steel Foundry Facts award for excellence of material published in the society's technical publication.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SUPPLY TRADE NOTES

W. H. MINER, INC.—*William E. Withall,* formerly assistant to president, W. H. Miner, Inc., Chicago, has been elected first vice-president.

Mr. Withall began his career with Miner in 1937 in its foundry and research laboratory. In 1941 he was transferred to the sales department where he continued until 1942 when he enlisted in the United States Navy, serving as a lieutenant in ordnance through 1945. Upon his return to Miner in January 1946, Mr. Withall became assistant to president.

W. E. Withall

◆

PEERLESS MACHINE COMPANY.—*C. O. Wanvig, Jr.,* formerly secretary of the Peerless Machine Company, Racine, Wis., has been elected president of the company, succeeding the late *J. R. McDonald.*

◆

MONTREAL LOCOMOTIVE WORKS.—*Herbert J. Purcell* has been appointed material procurement manager for the Montreal Locomotive Works, Ltd. Mr. Purcell, who has been with the company since 1942, will be in charge of purchasing, stores, and expediting of materials.

PITTSBURGH PLATE GLASS COMPANY.—*G. Donald Campbell* has been appointed superintendent, and *John A. McMillan* plant engineer, for the recently purchased Shelbyville, Ind., manufacturing plant of the Pittsburgh Plate Glass Company. Conversion of the plant to fiber glass production will soon be underway.

◆

F. E. SCHUNDLER COMPANY.—*Earl W. Rosa,* has been appointed sales manager of the F. E. Schundler Company, Joliet, Ill. Mr. Rosa, who has been with the company for 11 years, will direct sales of Perlite, Vermiculite and insulating blocks and cements.

Earl W. Rosa

◆

INDEPENDENT PNEUMATIC TOOL COMPANY.—*Arthur H. Nelson,* service engineer for the Independent Pneumatic Tool Company of Chicago, has been appointed manager of electric tool sales at the Chicago branch.

◆

WORTHINGTON CORPORATION.—At a recent stockholders meeting of the *Worthington Pump & Machinery Corp.* it was voted to change the company name to Worthington Corporation. H. C. Ramsey, president, said no corporation policies or practices will be affected in any way by the name change, which has been brought about because "Worthington has extended its manufacturing activities into many other fields with the result that today, with few exceptions, every industrial and commercial enterprise is a potential user of one or more of the many other items of our equipment."

◆

STANDARD RAILWAY EQUIPMENT MANUFACTURING COMPANY.—*George N. Goad* has been elected vice-president of the Standard Railway Equipment Manufacturing Company's Canadian subsidiary, with headquarters in Montreal. Mr. Goad worked for Canadian railroads for 40 years, and was chief of car service for the Canadian National before joining Standard Railway in 1939.

G. N. Goad

◆

SPRING PACKING CORPORATION—*John B. Welch* has been elected vice-president in charge of the Industrial Division of Spring Packing. Mr. Welch formerly assistant vice-president, now directs Spring Packing activities in pressure-sensitive industrial joint sealants and Spring-Kote spray-on protective coatings for metals and masonry. He will make his headquarters at the Chicago general offices.

O. F. Brookmeyer

R. M. Dilworth

Walter N. Fritts

G. M. La Riviere

R. L. Terrell

GENERAL MOTORS APPOINTMENTS

Two members of the *Electromotive Division* of General Motors, have been assigned to look into "post-diesel application of E.-M.D.'s skills and facilities" from the standpoints of engineering and commercial availability. *O. F. Brookmeyer*, former general sales manager, and *R. M. Dilworth*, former chief engineer, will "study ways in which engineering and manufacturing techniques and facilities accumulated in the development of the diesel locomotive may be applied in the development of other products beneficial to American railroads." Mr. Dilworth—who for the past few years has headed the advanced engineering activity of E.-M.D.—is to explore the engineering aspects, and Mr. Brookmeyer the commercial availability aspects.

Nelson C. Dezendorf, general manager of Electro-Motive and vice-president of the parent General Motors Corporation, in announcing the new program, made it clear that these future developments would not be put in operation until railroad dieselization demand will permit a reduction in current high locomotive manufacture. "It will be several years," he said, "before railroad demand for diesel locomotives is satisfied to the point that any major portion of our manpower and facilities would be diverted to other activities."

Walter N. Fritts, assistant general sales manager of the *Electro-Motive Division* of General Motors Corporation, has been appointed general sales manager, succeeding *O. F. Brookmeyer*, who has been placed on special assignment. The Eastern region, formerly headed by *Paul R. Turner*, now director of sales, has been divided into two new regions. One, still known as the Eastern region, will be at New York, and will be headed by *G. M. LaRiviere*, who is transferred from the post of manager of the St. Louis region. The other, with headquarters at Washington, D. C., will be known as the Southeastern region. *R. L. Terrell*, former assistant manager of the Eastern region, will be its manager. *Frederick W. Walker*, district sales manager, Chicago region, has been named manager, St. Louis region. *George W. Rukgaber*, sales manager, east central district, Chicago region, has been appointed sales manager, western district, at Chicago, and is succeeded by *Floyd E. Von Ohlen*, sales representative, Chicago region.

Mr. Brookmeyer before joining Electro-Motive in 1925, spent 20 years with the Cleveland, Cincinnati, Chicago & St. Louis

Frederick W. Walker

Floyd E. Von Ohlen

(New York Central) ultimately resigning from the position of superintendent of transportation at Indianapolis. While with the railroad, he was active in application of gas-electric rail cars to Big Four service. With E.-M.D. he subsequently directed sale of rail cars prior to development of the diesel locomotive.. Continuing, he directed sales aspects of the introduction of the new motive power and carried it from virtual infancy to its present state as a fully accepted type of equipment.

Mr. Dilworth joined Electro-Motive in 1926 after having experience in the construction of gas-electric rail cars with General Electric. During World War I he served the U. S. Army Engineer Corps as senior civilian engineer and was in charge of the Manila and Subig Bay district in the Philippines. On April 5, 1948, he became engineering assistant to the vice-president of E.-M.D., and in that capacity has been in charge of Electro-Motive's advanced engineering projects that fall outside the scope of normal engineering activities.

Mr. Fritts began work at Electro-Motive in 1935 as a draftsman. Three years later, he was promoted to junior engineer and six months later became an assistant engineer. In 1943, he was appointed assistant section manager. In 1945, he transferred to the sales depatment as sales engineer and in November of that year became manager of the newly-formed sales engineering section. He was named assistant general sales manager in 1949.

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Mr. LaRiviere, who has been regional manager at St. Louis since 1947, joined E.-M.D. as district sales manager at Washington in 1944. Before coming to Electro-Motive he had served for 21 years with the Atlantic Coast Line and the Canadian National in various traffic department capacities.

Mr. Terrell, who has been assistant regional manager of the New York (Eastern) region since April 1950, joined General Motors Research Laboratory at Detroit as an apprentice in 1936. He later served a year and a half as an engine mechanic in the Army Air Forces. He then returned to General Motors Research. In 1939 he joined Electro-Motive as a service engineer and before entering the Navy in 1942 was an installation engineer. He returned to E.-M.D. in 1945 and was appointed district sales manager at Washington in 1946 and general parts manager in 1948.

Mr. Walker, a graduate of Lehigh University, where he received a B.S. degree in industrial engineering, served as an instructor in machine design at the University in 1936-37. He joined Electro-Motive in June 1937 as an apprentice became application engineer in 1945, manager of statistics and market analysis in 1946, and district sales manager in the Chicago region in 1949.

Mr. Von Ohlen, who was a sales representative for the Chicago region from March 1951 until his recent promotion, joined Electro-Motive in 1942 as a tester in the engine division. In 1944 he was transferred to the service department as an instructor, in 1946 assistant manager of the new locomotive section, in July 1942 became manager of this section, and in 1950 sales engineer, which position he held until his appointment as district sales representative for the Chicago region.

◆

F. W. Evinger

LEHON COMPANY.—*Fred W. Evinger* has joined the Lehon Company at Chicago as sales representative. He had been with the Patterson Sargent Company since 1944.

◆

CORNING GLASS WORK.—*Charles L. Day*, formerly eastern sales district manager for the technical products division of the Corning Glass Works, has been appointed manager of the new sales district office recently opened in Washington, D. C. Mr.

Day will act in a liaison capacity between Corning research, engineering and manufacturing groups and various agencies and departments of the federal government.

◆

Graybar Electric Company.— *W. E. Henges* has been elected president of the Graybar Electric Company, to succeed *A. H. Nicoll.* Mr. Nicoll, who formerly was both president and chairman of the board, will continue as chairman. Mr. Henges joined

W. E. Henges

Graybar in 1913 at St. Louis. In 1942 he was appoined district manager there and two years later was transferred to Cleveland as district manager. He was elected a director of the company in 1949; vice-president in 1950, and early last year was elected a member of the executive committee.

◆

Patterson Sargent.—*Don R. Myers* has been appointed Chicago representative of Patterson Sargent succeeding F. W. Evinger, resigned.

◆

General Steel Castings Corporation. —*Winthrop B. Reed* has been appointed district manager—miscellaneous sales of the General Steel Castings Corporation at Eddystone, Pa.

Mr. Reed began his career as assistant foreman in the inspection department of

Winthrop B. Reed

General Steel at Eddystone in 1946 after several years service with the army. In 1947 he became sales representative in the miscellaneous sales department and

later was appointed sales engineer for the company's eastern district sales offices. Since 1950, he has been arranging with the Ordnance Corps for supply and facilities contracts in connection with the company's production of armor steel castings.

◆

Safety Car Heating & Lighting Co.—*John F. Runge* has been appointed manager of the railroad sales division, New York

J. F. Runge

C. E. Hughes

K. T. Benninger

district, of the Safety Car Heating & Lighting Co., at New York; *Charles E. Hughes* has been appointed manager of the railroad sales division, New England district, in New Haven, Conn.; *K. T. Benninger* has been appointed sales representative, with headquarters in the Chicago district office.

◆

Combustion Engineering-Superheater, Inc.—*Bard Browne,* vice-president of Combustion Engineering-Superheater, Inc., has retired. *Francis J. Dolan,* general manager of the Superheater Company division, succeeds Mr. Browne.

Mr. Browne has been a vice-president of the company since the merger of the Combustion and Superheater organizations several years ago. Prior to then he was a vice-president of the Superheater Company and was in charge of sales and service for that company and also the American Throttle Company. He continued to exercise these responsibilities as a vice-president of Combustion Engineering-Superheater, Inc. Mr. Browne, who received his technical education at Drexel Institute and the University of Pennsylvania, entered railroad service in Kansas City, Mo. Prior to entering the employ of the Superheater Company in 1915, he was associated with railroads and locomotive builders both in domestic and foreign service. Mr. Browne plans to remain active in the railway supply business.

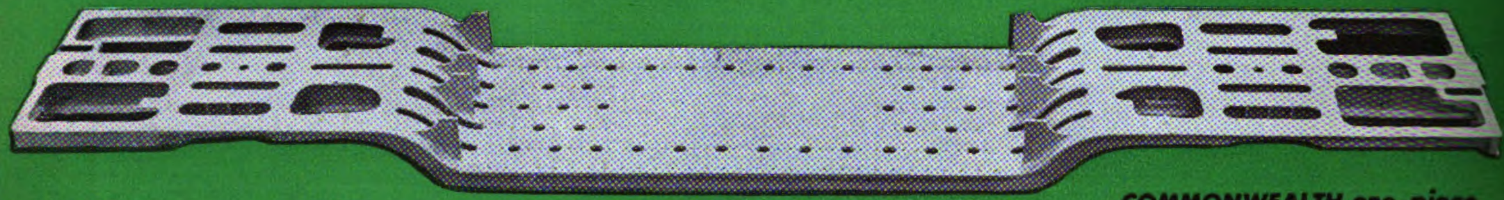
Bard Browne

Francis J. Dolan

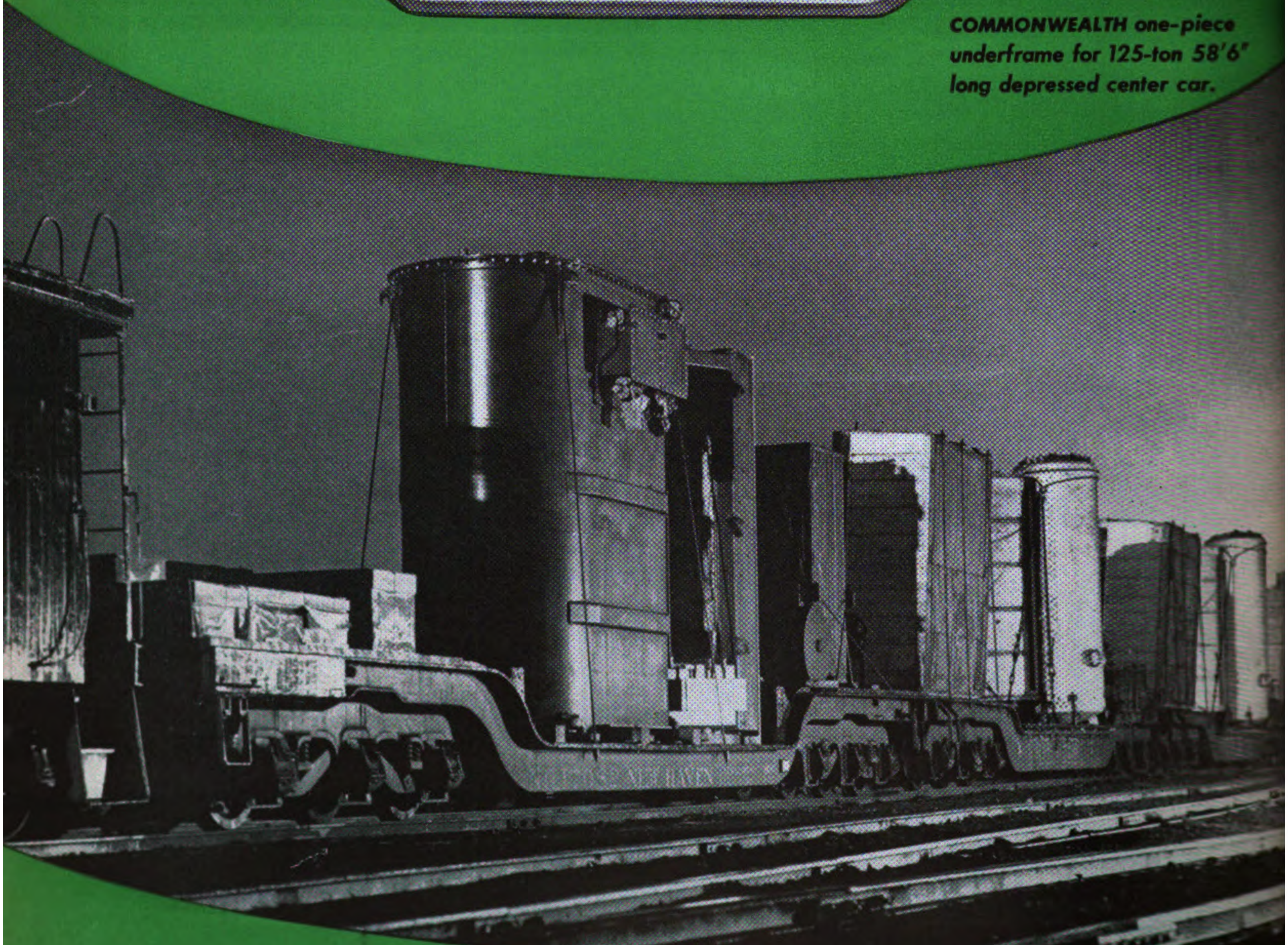
Mr. Dolan began his career with the Baltimore & Ohio (Staten Island Rapid Transit), where he worked successively in the stores, motive-power and floating-equip-

(*Continued on p. 110*)

More and More Special Service Freight Cars



COMMONWEALTH one-piece underframe for 125-ton 58′6″ long depressed center car.



Depressed center cars of the New Haven and the Erie Railroads transporting boilers and other equipment for U. S. Navy destroyers.

GENERAL

GRANITE CITY, ILL.

with **COMMONWEALTH**

CAST STEEL UNDERFRAMES AND TRUCKS

Are Transporting Heavy Loads

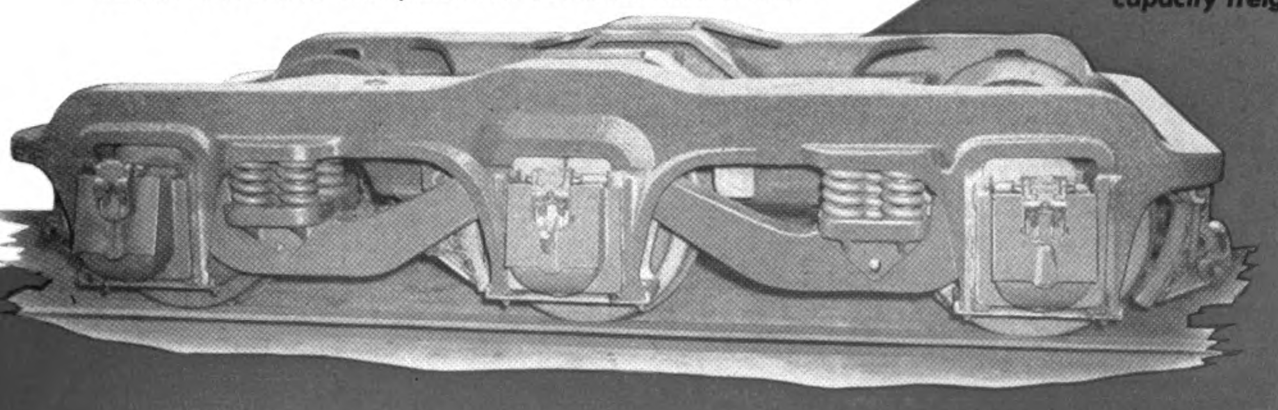
COMMONWEALTH one-piece cast steel underframes and 6-wheel trucks of proven design are being used on more and more heavy duty freight cars, assuring high availability and low maintenance expense.

These underframes combine the important elements of great strength with minimum weight, extreme durability and simplicity. For flat cars, depressed center cars and pulpwood cars, the one-piece design makes possible a lower car height from rail to loading floor, permitting easier loading and higher loads. It also provides a uniform surface for floor application.

COMMONWEALTH 6-wheel equalized trucks for high capacity freight cars provide positive equalization and adequate spring capacity which are essential to efficient, safe, economical operation. The rugged one-piece truck frames with machined integral pedestals assure true alignment of wheels and axles.

For higher availability and true upkeep economy in flat cars, depressed center cars, pulpwood cars, sulphur-carrying cars, ore cars, well cars and others — build them with COMMONWEALTH one-piece underframes and trucks.

COMMONWEALTH 6-whe equalized truck for high capacity freight cars.



STEEL CASTINGS

EDDYSTONE, PA.

(*Continued from page 107*)

ment departments. He later became associated with the Delaware & Hudson, where he served in the comptroller's department. In 1920 he joined the Locomotive Superheater Company, predecessor of the Superheater Company, as office manager at New York. In 1933 he was appointed assistant secretary and assistant treasurer of the company and, in 1938, assistant to the vice-president in charge of sales and service of locomotive equipment.

◆

National Electric Products Corporation.—A new sales and service department has been announced by the National Electric Products Corporation, of Pittsburgh.

Dixie Cup Company—The Dixie Cup Company has started operations in its new one-story 100,000 sq. ft. plant at Anaheim, Calif. Production capacity in the company's main plant at Easton, Pa., is also being increased by the addition of a new unit. Sizeable additions have also been made to plants at Fort Smith, Ark., and Brampton, Ont.

◆

American Brake Shoe Company. — *Norman A. Matthews* has been appointed assistant chief metallurgist of American Brake Shoe Company's metallurgical research department at Mahwah, N. J. Mr. Matthews was formerly division metallurgist for the Electro-Alloys Division at Elyria, Ohio.

Mr. Matthews, who is a graduate of Massachusetts Institute of Technology, joined American Brake Shoe in 1946. He was a Lieutenant Colonel in the Army Ordnance Department in World War II, and served as the director of the ferrous metallurgical laboratory at the Watertown, Mass., arsenal.

American Brake Shoe has purchased the plant and property formerly owned by the Jumbo Steel Company in Azusa, Cal. The American Forge division of Brake Shoe will use the plant to start a west coast steel forging operation.

◆

Oakite Products, Inc.—The offices of the Oakite organization have been moved to 19 Rector street, New York 6.

◆

DeVilbiss Company.—*Henry M. Kidd* has been appointed vice-president and sales manager of the DeVilbiss spray-painting equipment division.

Mr. Kidd became associated with DeVilbiss in its sales training course over 18 years ago. After this indoctrination, he became a sales correspondent. He was appointed assistant sales manager in 1944 and, sales manager of the spray-painting equipment division in October 1950.

◆

Allis-Chalmers Manufacturing Company.—*J. D. Greensward* has been appointed manager of a newly organized apparatus department of the Allis-Chalmers Manufacturing Company. Mr. Greensward will continue also as general manager of the company's Norwood Works. The Tex-rope drive and pump departments, under the continuing management of *T. C. Knudsen* and *H. P. Binder*, respectively, will be operated as sections of the apparatus department.

◆

John A. Roebling's Sons Company.—The Roebling company has moved its Los Angeles district office and warehouse to a new building at 5340 East Harbor street. The building is almost entirely of glass and red brick, and has 44,500 ft. of floor space.

◆

Thomas A. Edison, Inc.—Thomas A. Edison, Inc., has broken ground for a new half-million dollar laboratory at West Orange, N. J. The one-story, reinforced concrete building will provide 7,400 sq. ft. of new space, with a total of 13,000 sq. ft. of space when the new structure is joined with two older buildings that are to be renovated. Construction is to be completed in about 10 months.

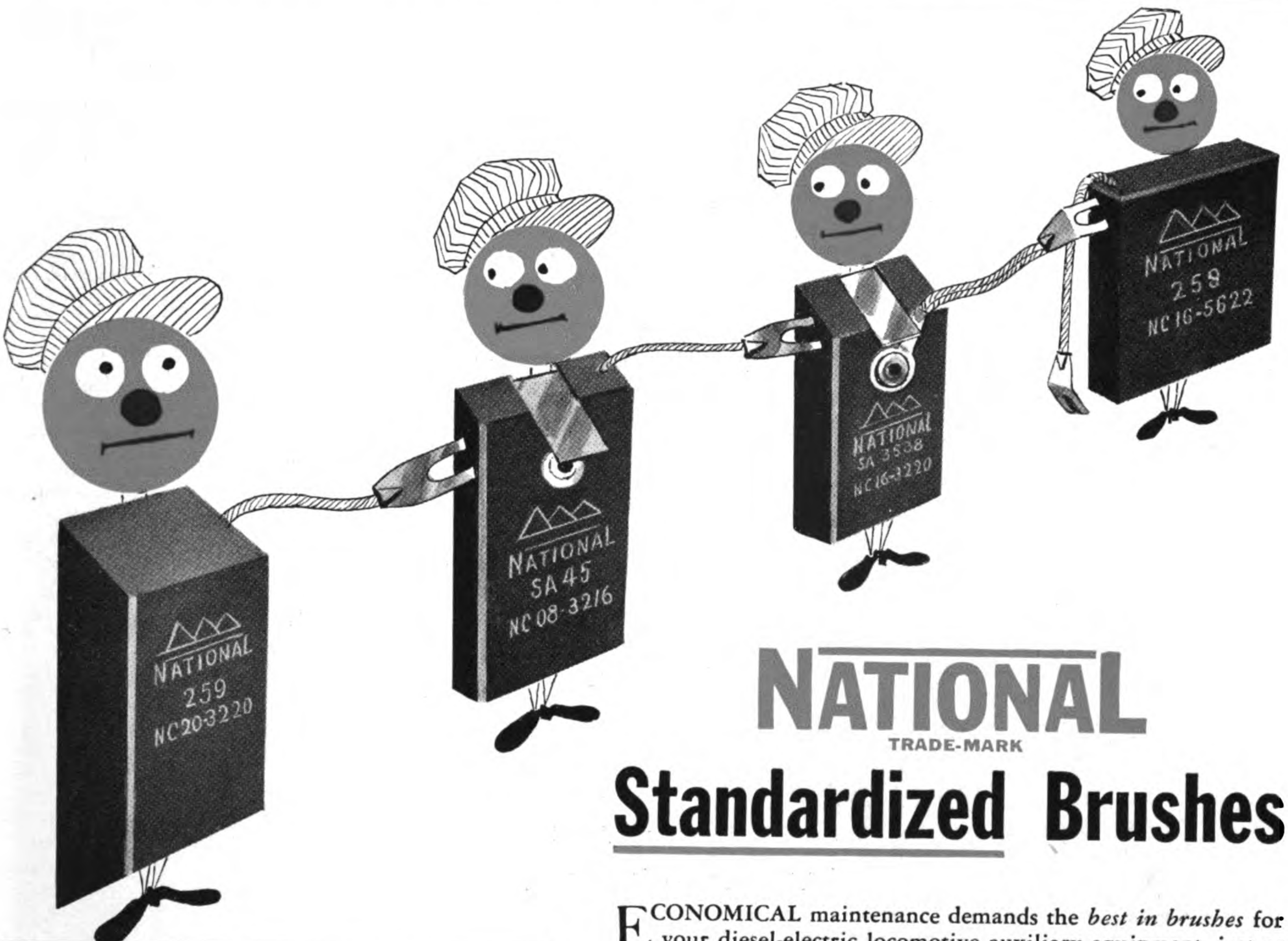
Obituary

Andrew S. Butler, 75, president of the McDougall-Butler Company, Buffalo, N. Y., died on March 25, after a long illness.

Samuel H. Conwell, retired vice-president of the Standard Railway Equipment Manufacturing Company, died April 2 while vacationing in Saratoga, Cal. He had retired January 1, after 44 years' employment with the firm.

(*Continued on page 116*)

"Right Dress" for Diesel-Electric AUXILIARY EQUIPMENT



NATIONAL

TRADE-MARK

Standardized Brushes

ECONOMICAL maintenance demands the *best in brushes* for your diesel-electric locomotive auxiliary equipment, just as it does for diesel-electric main generators and traction motors. That's why National Carbon has standardized all down the line . . . now offers you the full advantages of purchase from stock with its consequent uniform quality, low cost and quick delivery on the standardized auxiliary brushes listed below.

Like other "National" Carbon Brushes, STANDARDIZED auxiliary equipment brushes *cost less* – any way you look at it. *Uniform dependability* means lot-to-lot freedom from breakage, shunt-loosening or other brush failures. *Commutator maintenance* is reduced by service-proved grades. High electrical and mechanical *efficiency* contribute to operating economy. All together, they mean *longer brush life.*

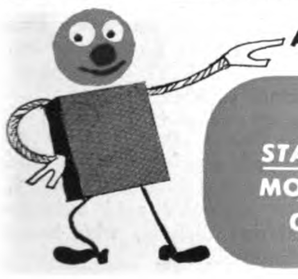
DON'T FORGET . . . "NATIONAL" STANDARDIZED BRUSHES GIVE YOU A BETTER PRODUCT . . . IN A BETTER PACKAGE . . . AT A BETTER PRICE!

"National" Standardized Brushes for D-E Locomotive Auxiliary Equipment

BRUSH NO.	SIZE	GRADE
NC 16-3220	1¾ x 1 x ½	SA-3538
NC 16-5622	1¾ x 1¾ x ½	259
NC 20-3220	2 x .993 x .618	259
NC 08-3216	1¾ x 1 x ¼	SA-45

LOW LIGHT BILLS . . .

. . . mark phenomenal acceptance of the "EVEREADY" No. 1050 Industrial Flashlight Battery by a broad cross-section of industry. Delivering *twice the usable light* of any battery we've ever made before, it will not swell, stick, or jam in the flashlight . . . has no metal can to leak or corrode.



ADD THEM UP! THEY TOTAL THE FINEST BRUSH MONEY CAN BUY.

BUY NATIONAL STANDARDIZED BRUSHES FOR MOST EFFICIENT MOTOR AND GENERATOR OPERATION.

The terms "National", "Eveready", the Three Pyramids device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street, New York 17, N. Y.

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

In Canada: National Carbon Limited, Montreal, Toronto, Winnipeg

(Continued from page 110)

FRANKLIN L. BARBER, president of the Standard Car Truck Company of Chicago, died March 26. Mr. Barber was a former director of the Kensington Steel Division of Poor & Co.

BEST PRATT, founder and chairman of the Air Brake Equipment & Supply Co., died March 29, at the age of 76. Mr. Pratt, an authority and inventor in the air-brake field, had worked for the New York Air Brake Company, Chicago, for 22 years.

PERSONAL MENTION

Boston & Maine

F. G. FOWLER, assistant general foreman at Boston Diesel Terminal, appointed mechanical inspector at Boston.

W. B. WILLIAMS, mechanical inspector at Boston, assigned to position of mechanical inspector at Greenfield, Mass.

NORMAN PETERSON, assistant shop superintendent, Billerica, Mass., appointed assistant general foreman at Boston Diesel Terminal. Position of assistant shop superintendent abolished.

Canadian Pacific

W. A. VANDERLAND has been appointed combustion engineer, Prairie and Pacific regions, with headquarters in Winnipeg, Man.

Chicago & North Western

M. H. CRANDALL appointed assistant diesel supervisor, with headquarters at Council Bluffs, Iowa.

Elgin, Joliet & Eastern

PAUL H. VERD, superintendent motive power and equipment at Joliet, Ill., has been appointed general superintendent.

HAROLD E. NIKSCH, master mechanic at Joliet, Ill., has been appointed superintendent of motive power and equipment.

Education: Armour Institute of Technology (degree in mechanical engineering).

Harold E. Niksch

Career: Joined the Chicago, Milwaukee, St. Paul & Pacific in 1924 as a special apprentice, later holding several engineering positions. Appointed master mechanic in 1943. Joined the E. J. & E. as master mechanic in 1947.

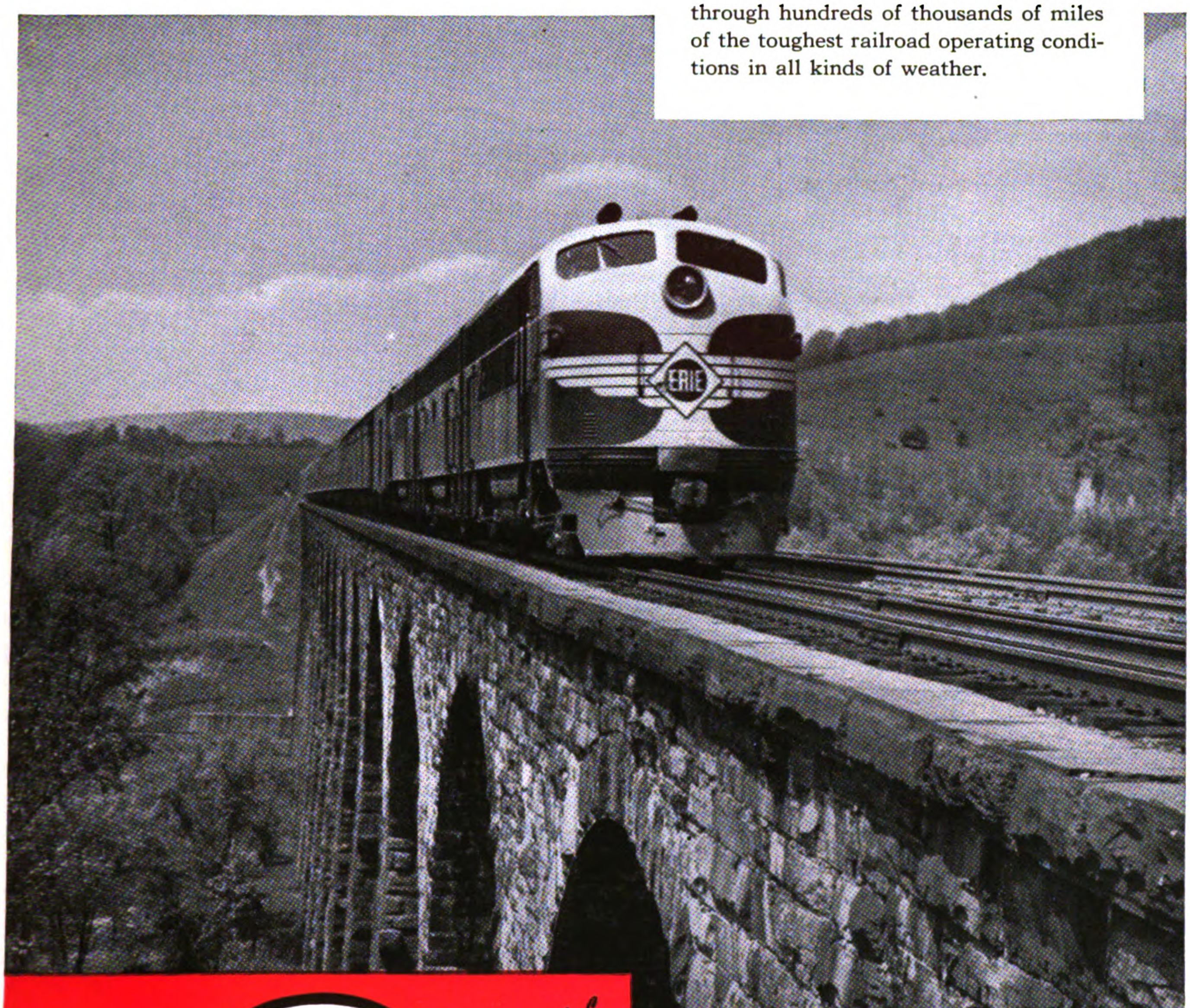
GEORGE W. BURNETT, mechanical inspector, has been appointed master mechanic at Joliet, Ill.

Erie

R. C. HULBERT, road foreman of engines, Marion division, has been appointed road foreman of engines, Meadville and B. and S. W. divisions, at Meadville, Pa.

J. W. HANK, assistant district fuel supervisor, Western district, at Meadville, Pa., has been appointed road foreman of engines, Susquehanna and Tioga divisions, with headquarters at Hornell, N. Y.

NORMAN T. EMRICK, road foreman of engines, New York division, Buffalo, and Susquehanna divisions, since November 1, 1945, has been appointed road foreman of engines, Marion division, with headquarters at Hammond, Ind.



H. D. McConahy, division car foreman at Meadville, Pa., has been appointed division car foreman at Marion, Ohio.

R. Knorr, division car foreman at Marion, Ohio, has retired.

C. H. Schueler has been appointed division car foreman at Meadville, Pa.

Missouri-Kansas-Texas

J. L. Rouch, general foreman of the Parsons, Kan., locomotive shops, has been appointed superintendent of the Warden locomotive shops at Waco, Tex.

New York Central

G. M. Schmidbauer has been appointed superintendent of shop (car) at West Albany, N. Y.

C. H. Mendler, superintendent of shop (car) at West Albany, N. Y., has retired.

C. M. Ferguson appointed special inspector, with headquarters at Detroit.

Norfolk & Western

F. H. Wilbourne, foreman at Iaeger (W. Va.) shop, has been appointed assistant road foreman of engines, Radford division.

S. L. Wohford, gang foreman at Petersburg, Va., has been appointed foreman at Iaeger (W. Va.) shop.

George E. Payne, night roundhouse foreman at Shaffers Crossing (Va.) shop, has been appointed general foreman at Winston-Salem, N. C.

Dewey E. Grayson, assistant roundhouse foreman, Shaffers Crossing (Va.) shop, has been appointed night roundhouse foreman at Shaffers Crossing.

E. C. Crowder, Jr., gang foreman, has been appointed assistant roundhouse foreman, Shaffers Crossing (Va.) shop.

Pennsylvania

J. E. Wightman, superintendent motive power—diesel, Central Region, appointed superintendent, Lake division.

G. R. Weaver, master mechanic, Maryland-Delmarva divisions, appointed superintendent motive power—diesel, Central Region.

W. H. Yarber, assistant master mechanic, Philadelphia division, appointed master mechanic, Lake division.

A. O. Taylor, master mechanic, Lake division, appointed master mechanic Pittsburgh and Conemaugh divisions.

W. H. Weaver, foreman, Pitcairn steel shop, Pittsburgh division, appointed assistant master mechanic, Pitcairn, Pa., Pittsburgh-Conemaugh divisions.

H. L. Wood, assistant foreman, 59th street enginehouse, Chicago, appointed master mechanic, Philadelphia division.

W. H. Meier, enginehouse foreman, Cresson, Pa., Pittsburgh division, appointed enginehouse foreman, Conemaugh, Pa., Pittsburgh division.

W. J. Clark, assistant enginehouse foreman—first trick, Shire Oaks, Pa., Pittsburgh division, appointed enginehouse foreman, Cresson, Pa., Pittsburgh division.

W. H. Turnbull, Jr., gang foreman, East Altoona enginehouse and acting foreman, Osceola enginehouse, appointed foreman, Osceola enginehouse.

E. Garner, foreman, Terre Haute car shop, Southwestern division, appointed foreman, Pitcairn steel shop, Pittsburgh division.

J. E. Stover, assistant enginehouse foreman—relief, 28th street, Pittsburgh, Pittsburgh division, appointed assistant enginehouse foreman—diesel, Pitcairn, Pa., Pittsburgh division.

H. L. Ker, assistant enginehouse foreman, Erie, Northern division, appointed assistant enginehouse foreman—relief, 28th street, Pittsburgh, Pittsburgh division.

A. V. Oakley, gang foreman, Pittsburgh division, appointed assistant enginehouse foreman, Erie, Northern division.

W. R. Troxell, gang foreman 28th street engine house, Pittsburgh division, appointed assistant enginehouse foreman—second trick, Shire Oaks, Pa., Pittsburgh division.

A. M. Schuler, assistant enginehouse foreman—second trick, Shire Oaks, Pa., Pittsburgh division, appointed assistant enginehouse foreman—first trick, Shire Oaks, Pa., Pittsburgh division.

Seaboard Air Line

R. W. Rogers, chief mechanical officer at Norfolk, Va., is serving temporarily as director of the Railroad Division of the National Production Authority. He will be in Washington until early fall.

H. S. Mercer, assistant chief mechanical officer, is serving as acting chief mechanic officer at Norfolk, Va.

O. G. Wood, Jr., foreman of the car and locomotive department at Monroe, N. C., has been appointed supervisor car department at Raleigh, N. C.

Union Pacific

J. D. Killian, master mechanic, Oregon division, Portland, Ore., appointed mechanical superintendent for steam power at Omaha, Neb.

Born in Ava, Ill., 1897.

Career: Joined U. P. in 1915 as machinist helper at Rawlins, Wyo. Served at posts in Nebraska, Colorado, Idaho, and California, rising through several supervisory positions in mechanical department. Appointed master mechanic in 1949.

PERSONAL MENTION—*Obituaries*

Peter Kass, retired superintendent car department for the Chicago, Rock & Pacific, died at his home in Chicago March 23.

J. E. Weiser, general foreman of the Norfolk & Western at Winston-Salem, N. C., died on February 4.

NEW DEVICES

(*Continued from page 94*)

nounced by the Illinois Bronze Powder Company, Chicago 6.

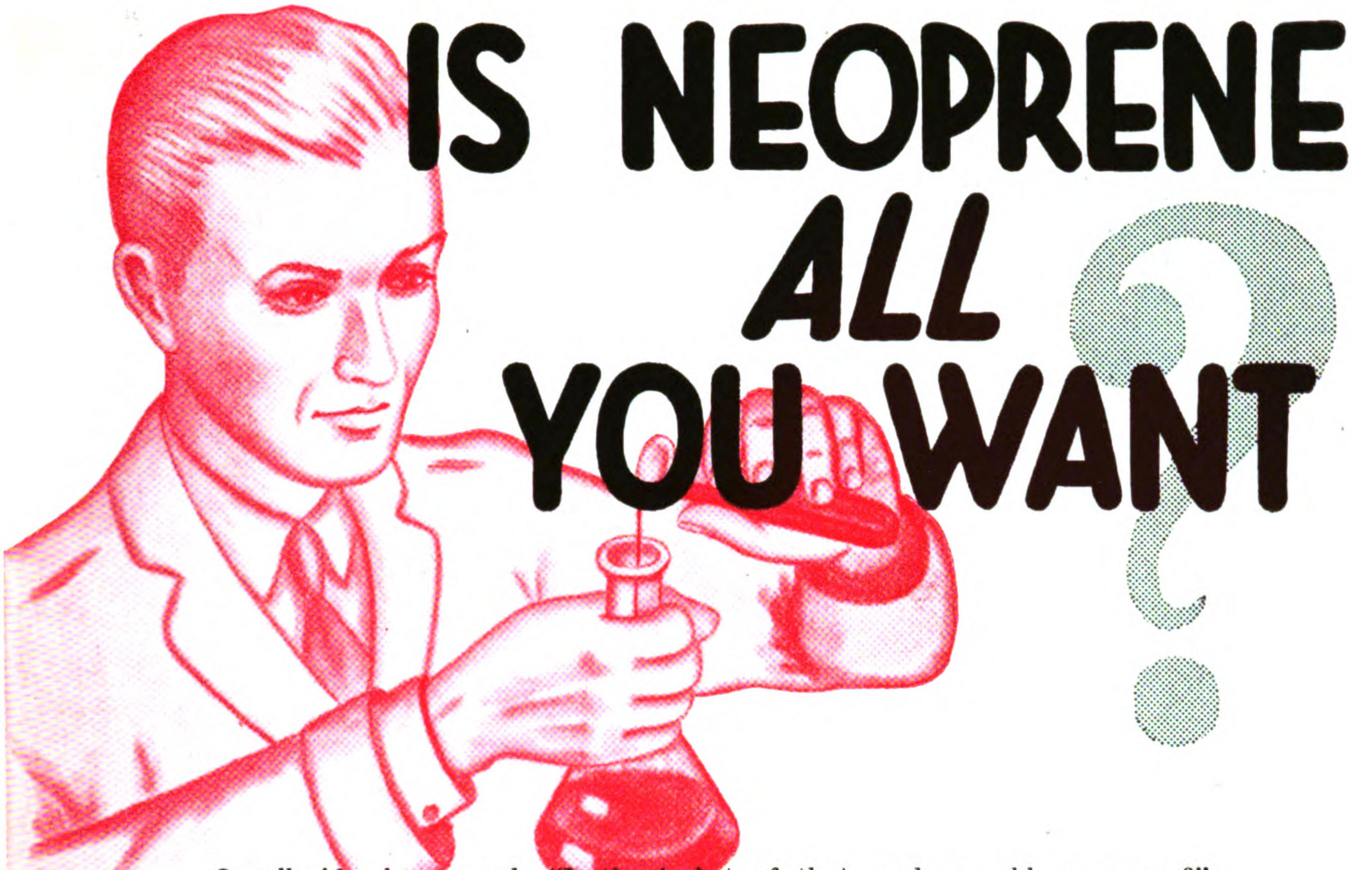
This product named Hi-Temp is a formulation of aluminum powders in a special vehicle. It is said to insure protection against peeling, discoloring, blistering and other problems caused by high heat.

Hi-Temp is recommended for railway and industrial uses including furnace fronts, boilers, engines, steam pipes, etc. No special surface preparation is needed, one coat will cover by brush or spray application. It dries in one to two hr.

◆

Spray Gun Supply Pump

A heavy duty unit featuring an air-operated pump for handling the new-type coatings, heavy paints and many other fluids has been announced by The Gray Company, Inc., Minneapolis 13, Minn. These air-oper-



On all sides buyers ask, "Is the jacket of that cord or cable neoprene?" When assured that it is, they seem quite satisfied that they are getting the highest quality product available. That is not necessarily a sound conclusion. Here's why.

Neoprene is only a raw material. To be of use it must be **properly** compounded with antioxidants, carbon black, vulcanizing agents, and other materials. In other words, technical skill in properly compounding neoprene is just as important as using neoprene itself.

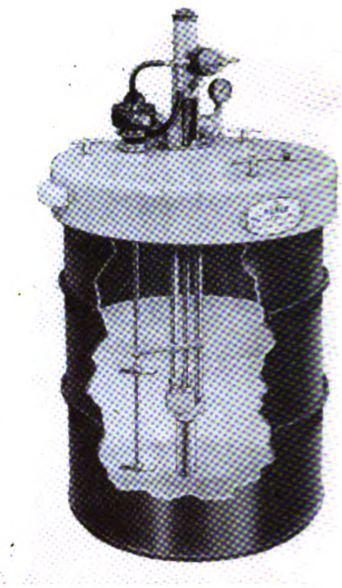
TIREX Cords and Cables were the first to be made in this country with a heavy duty jacket. Proof of the fact that compounding skill is important is shown by the fact that in the intervening thirty years TIREX has kept the leadership in the field of portable cords and cables. Simplex skill developed the cords and then kept them leaders against all comers.

The next time you need a portable cord or cable specify and be sure you get Simplex-TIREX Cords and Cables. The name is embossed on the jacket for your protection.

SIMPLEX-TIREX IS A PRODUCT OF SIMPLEX RESEARCH

SIMPLEX TIREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.



ated, double action reciprocating pumps, known as Paintmasters, are designed for supplying long-line circulating systems and multiple spray guns.

The circulating system in the unit delivers paint directly to the spray head and back through the supply lines. The dual-blade, air-operated rotary agitator features twin blades adjustable to any depth. A micrometer-type adjustment provides a full range of agitating speeds independent of paint pump operation.

With the circulating system, fire hazards can be reduced if the units are housed in a fireproof control room. Explosion hazards due to excessive air pressures are removed because no pressure vessel is used.

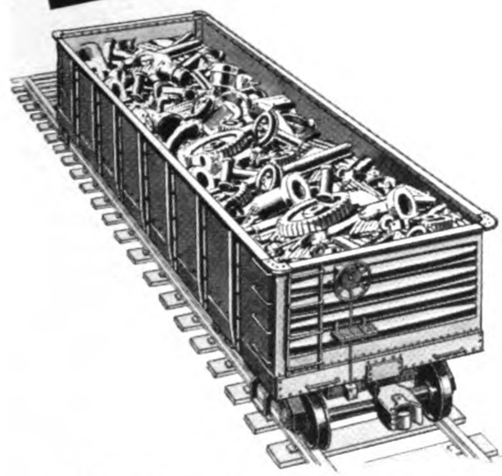
◆

Over-spray paint being peeled off the wall of a spray booth

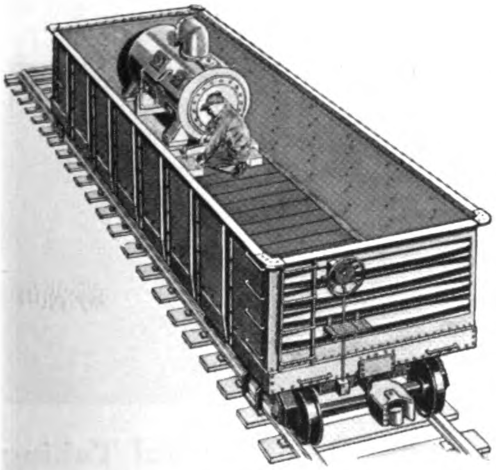
Coating for Paint-Spray Booths

A new vinyl-type paint spray booth coating material called Vincote, has been placed on the market by Detrex Corporation, Detroit 32, Mich. The material was developed for

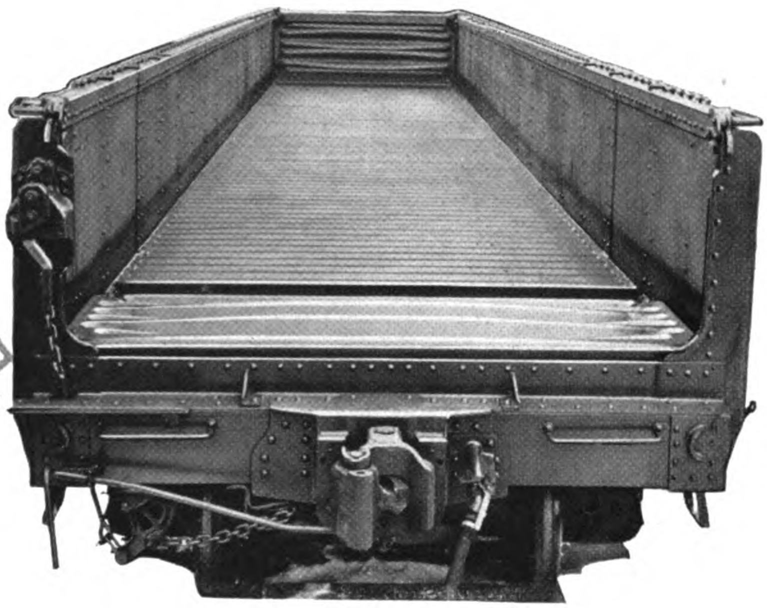
WHY USE TWO ... WHEN ONE WILL DO?



Inbound gondola carrying scrap may have a steel plate floor to which outbound finished freight cannot be blocked.



Result: a *second* car with a different type flooring, to which finished freight *can* be blocked, is often needed.



"GONDOLAS: Shortages are being reported by all principal railroads ..."
—Bulletin No. 80, 1-21-52
AAR Car Service Division

Gondolas equipped with NAILABLE STEEL FLOORING do double duty. Floored with steel, yet nailable . . . they can deliver rough freight and carry away finished freight which must be blocked. And, of course, the reverse is equally true. Cars equipped with N-S-F thus make possible less switching and deadheading of empties which, in turn, reduce operating costs—improve car supply.

Formed of tough N-A-X HIGH-TENSILE steel, N-S-F takes nails easily without damage to the floor . . . provides security for blocked and skidded loads . . . assures extra revenue years of service.

N·S·F
HOLDS BLOCKING BETTER
A GREAT LAKES STEEL PRODUCT

PATENTS PENDING

Sales representatives in Chicago, Philadelphia, St. Louis, Atlanta, Omaha, Denver, San Francisco, New York and Montreal.

GREAT LAKES STEEL CORPORATION
STEEL FLOOR DIVISION • Ecorse, Detroit 29, Michigan

PRODUCER OF N-A-X HIGH-TENSILE STEEL

NATIONAL STEEL CORPORATION

52-SF-3

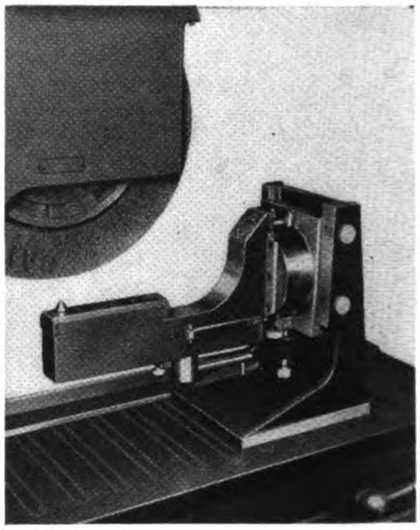
use on the side walls of both water-wash and dry paint spray booths. It possesses rapid drying properties and when sprayed on a booth wall forms a tough plastic film. It is not affected by enamel, lacquer and water.

The low adhesive properties of the material serve to simplify booth maintenance. When the paint over-spray has built up to a point where its removal is indicated, the coating and all over-sprayed paint is peeled off in large, easily removed sheets. Vincote also makes it unnecessary to use such hazardous materials as grease, paper, etc., on spray booth walls. It can be applied to booth walls with any standard spray equipment. A gallon of the material will cover from 275 to 400 sq. ft., depending upon the desired thickness.

◆

Grinding Wheel Dresser

A wheel dresser for the dressing of any wheel up to 36 in. in diameter has been developed. It maintains an accuracy of 0.0001 in. up to 14 in. diameter wheels and to 0.0005 in. on 36 in. wheels. This unit, coupled with a newly developed fix-



ture for under the wheel dressing, is marketed by the J & S Tool Co., Inc., East Orange, N. J., as the Fluid-motion dresser.

This unit can be adapted to cylindrical, tool and cutter grinders, as well as internal grinders. A series of fixtures converts it from a surface grinder wheel dresser to use on any other cylindrical type grinder.

The device dresses 2 angles tangent to a radius in one continuous motion with 0.0001 in. accuracy without the use of dovetails. These angles are dressed by continuing to push the handle in either or both directions after radius is formed. The diamond automatically returns to center position after dressing angles.

The dressers are made of alloy steels resistant to abrasive action, and are available in smaller size models with or without special fixtures and micrometer feed.

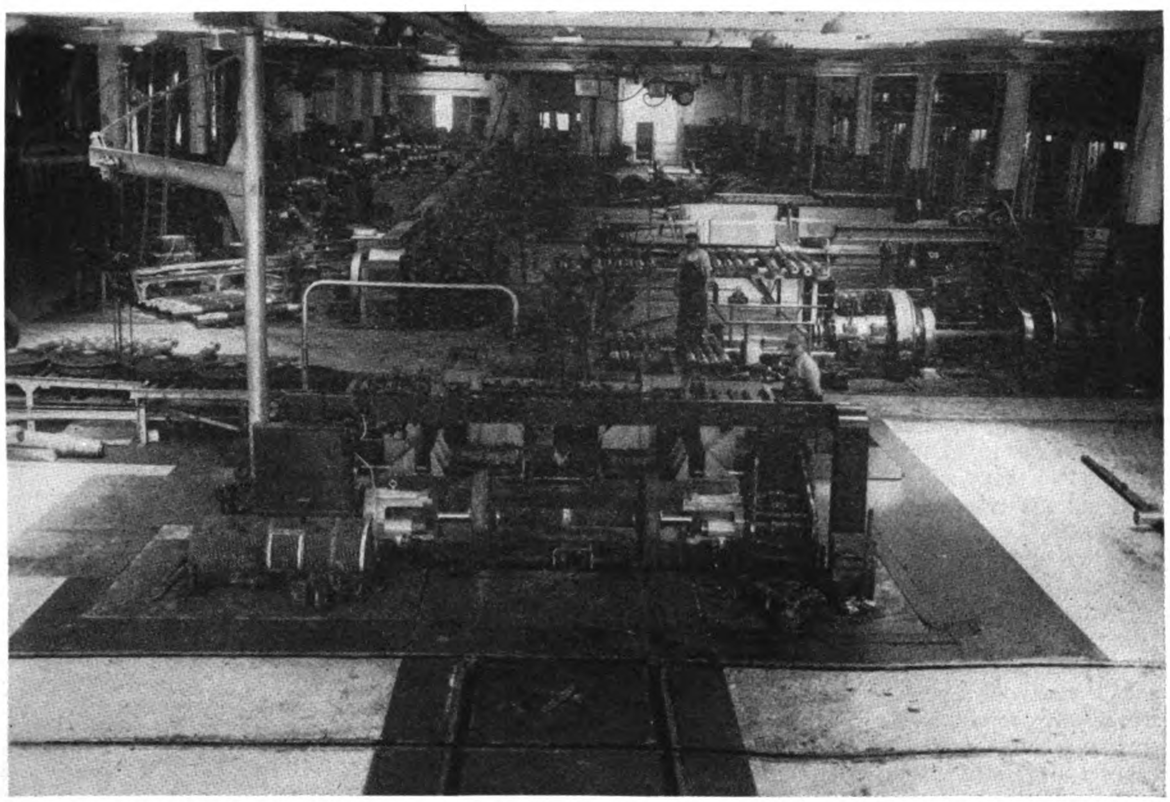
◆

Flexible Electrical Tubing

A type of electrical tubing, said to possess exceptional flexibility and heat endurance, has just been announced by the Irvington Varnish and Insulator Company, Irvington, N. J. It is known as Silicone Rubber Coated Fiberglas Tubing, is a Class H product, and is said to withstand an exposure of 200 hr. at 200 deg. C. without embrittlement.

This tubing is manufactured by using selected sizes of glass braid, which are coated with silicone rubber using a special multiple coat process to insure uniform coating and roundness. It will meet performance requirements of government specification Mil-1-3190 on Class H materials.

Railway Mechanical and
Electrical Engineer



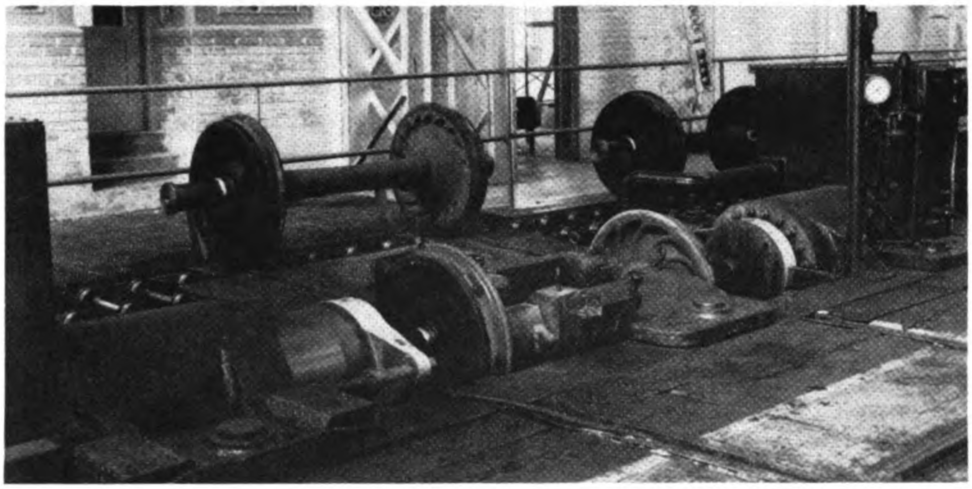
300-ton mounting press in the foreground at St. Paul wheel shop.

New Great Northern Wheel Shop

Modern shop at St. Paul, Minn., is designed to turn out 200 pairs of freight car wheels a day on a production basis with high accuracy and minimum manual handling

In order to provide about 46,000 pairs of mounted freight-car wheels annually, not to mention passenger-car and diesel locomotive wheels, the Great Northern has constructed a modern wheel shop at St. Paul, Minn. The shop is not yet in full production; in fact two machines are still to be installed, but 180 pairs of wheels are already being turned out daily, including 100 pairs of new freight-car wheels.

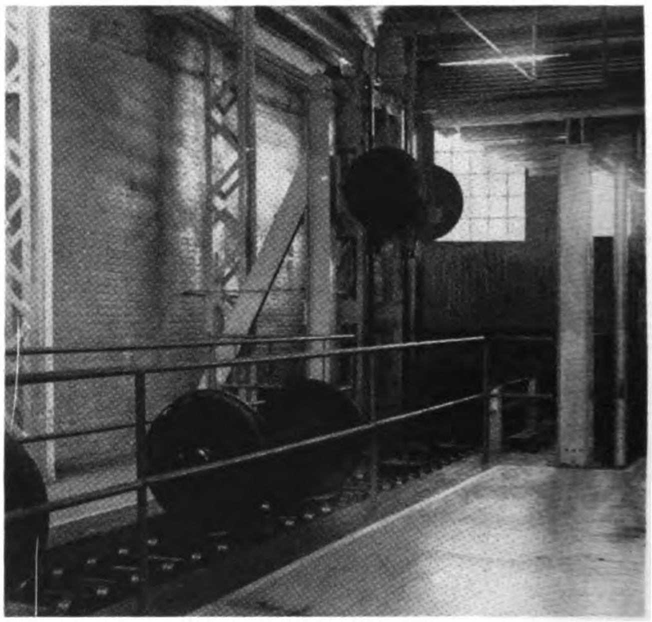
Association of American Railroads standards of accuracy and finish are fully maintained and the work is performed by a force of 17 mechanics and 7 helpers turning out mostly freight-car wheels during the day shift and a force of 9 mechanics and 2 helpers averaging about 17 pairs of passenger-car wheels and 8 pairs of diesel wheels on the night shift. The above force includes maintenance men, tool room men, etc. An idea of production



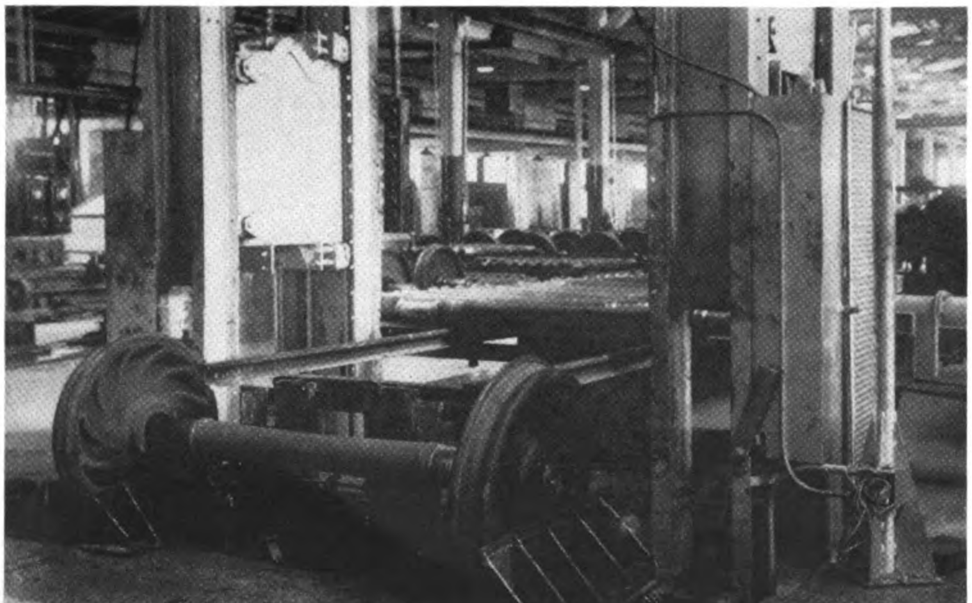
Watson-Stillman 600-ton dismounting press set on its side in the shop floor.

possibilities is afforded by the following stop-watch record of floor to floor times for a pair of wheels or single axle: wheels dismounted, 40 sec.; axle centered, 1 min. 20 sec.; wheel seats and journals machined, 13 min.; axle magnaglo-tested, 2 min.; wheels pressed on, 1 min. 5 sec. It is conservatively estimated that, in addition to getting more and better service from car wheels of all types due to quality workmanship in this modern-equipped wheel shop, the Great Northern will effect labor and other savings equivalent to a return of over 15 per cent on the investment.

The new wheel shop was located at Jackson Street, St. Paul, because of convenience in supplying the large number of mounted car wheels required annually at Superior for the Iron Range and at St. Cloud, Minn., for the freight-car building program, also at St. Paul where many passenger-car wheel changes are made. The entire east end of the railroad will be served, however, and some wheels, particularly for a limited number of passenger cars and diesel locomotives, will be shipped as far west as Havre, Mont. Forty-three special flat cars, designed to hold 44 pairs of wheels per car (with double-deck loading), are available for this large wheel movement over

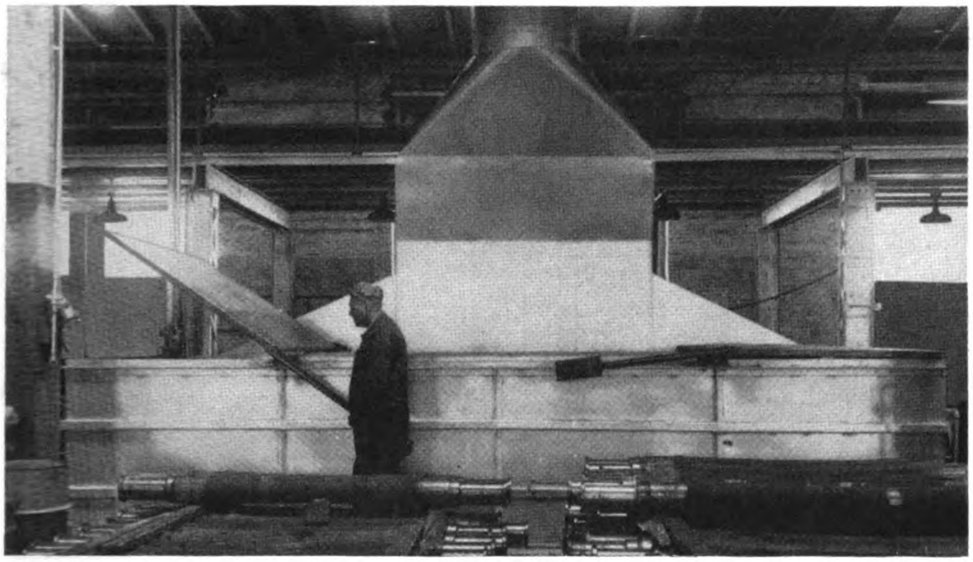


Wheel-lowering device and horizontal pullet-type wheel conveyor.



Where axles roll through to storage and wheels to scrap-wheel elevators.

How monorail passes the wheel press and circles the scrap-wheel elevators.



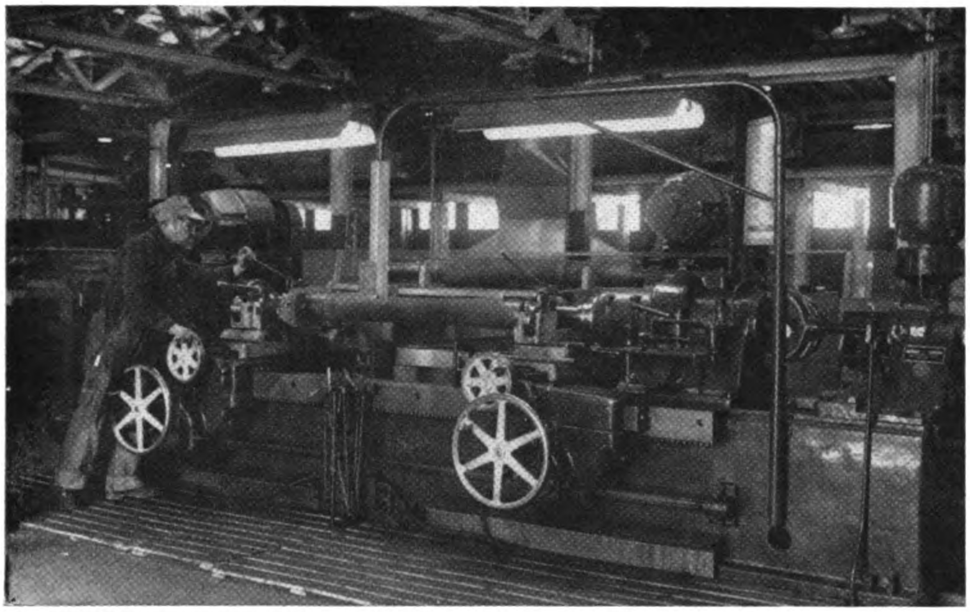
Diesel wheel-degreasing tank, with one of the counterweighted covers partly raised.

the system. Similarly, six modern steel flat cars are used to ship either passenger-car or diesel wheels, 11 pairs per car. Two of the six cars are roller-bearing equipped. These wheel cars require no blocking of wheels except to tie down those at each end of the car.

Building Changes Required

The building at Jackson Street which best met requirements for the type of wheel shop planned was the old passenger-car machine shop, 140 ft. wide by 300 ft. long, which provided ample space, but required certain structural changes and additions such as reinforcing roof trusses; taking out post supports; installing machine foundations and a concrete floor, also ramps, conveyors and overhead cranes of all types; making necessary track revisions; constructing outside traveling cranes for loading and unloading wheel cars, also concrete platforms for storing wheels.

Entirely aside from layout and facilities to speed up the movement of wheels and axles and minimize manual labor, the equipment of new shop will include: (1) a Watson-Stillman 600-ton press laid on its side in the shop floor so both wheels can be pressed off an axle and roll through to automatic elevators; (2) another Watson-Stillman 300-ton double-mounting roll-through press with easy floor level adjustment for different-size wheels; (3) Whiton powerful and accurate roll-through axle-centering machine; (4) Magnaglo test machine equipped for quick but thorough double-end axle inspection and also inspecting diesel wheels; (5) automatic fiber-brush cleaning of incoming axle journals and wire brushing of axle centers; (6) Sellers high-production profile-cutting wheel lathe and end-drive axle lathes; (7) two modern Betts car-wheel borers with special provision for supplying and taking away car wheels; (8) A.C.F. 45-in. wheel-tread grinding machine with drive set in the shop floor and used to true the wheel treads on passenger-car and diesel wheels and about 25 per cent of Great Northern freight-car wheels just before they leave the shop; (9) electric-eyes to control mounted-wheel door openings in winter and warn of a plugged scrap-wheel chute; (10) numerous electric stops and interlocks working in conjunction with



One of the three Sellers high-production end-drive axle lathes.

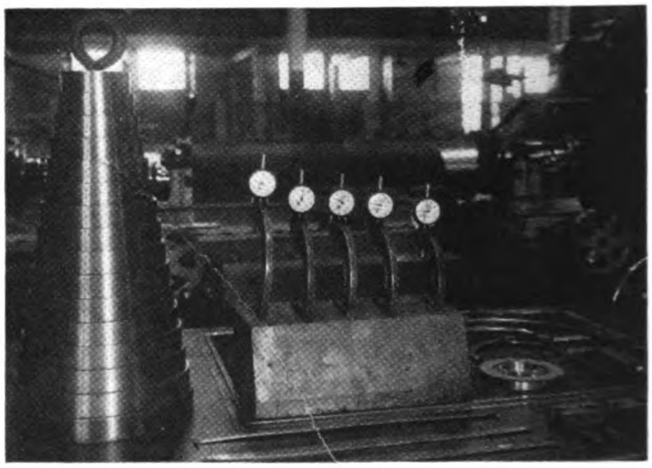
pneumatic cylinders to make the entire shop conveyor and crane operation automatic insofar as practicable.

The shop lighting and painting are both modern and functional. Ceiling mercury-vapor lamps, alternated with high-wattage, incandescent lamps, brilliantly illuminate an aluminum interior with gray floor and with red floor sections designating important machinery. The aisles and machine positions are outlined with special floor-lining tape of bright yellow.

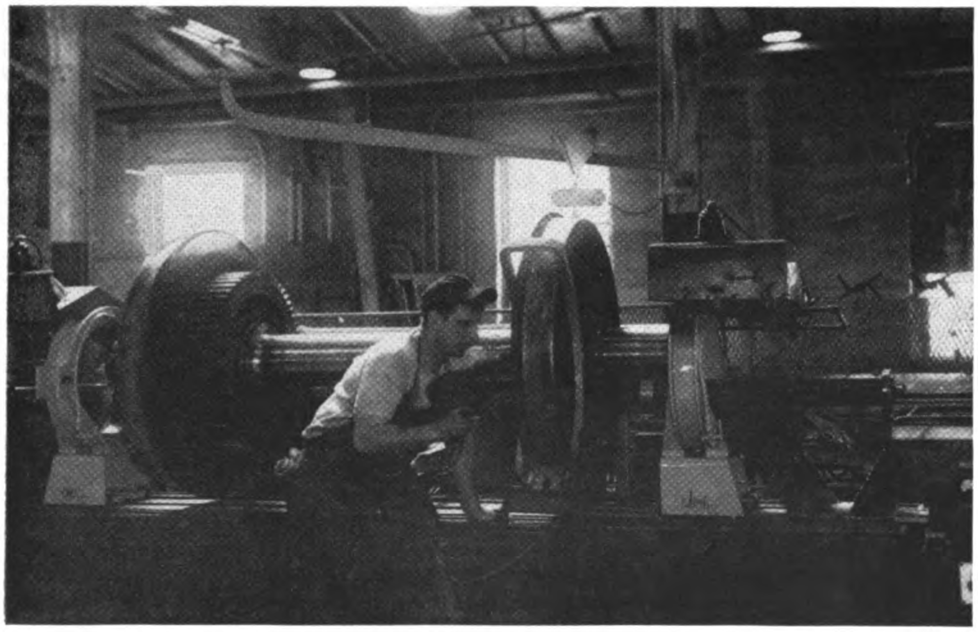
General Method of Operation

Incoming bad-order wheels are switched to the shop where a storehouse craneman picks them up with a Heppenstall automatic lifting tongs. They enter the shop at 1* and roll on an overhead incline the full length of the shop, or about 290 ft. Thus, approximately 100 pairs of wheels needing repair are stored and ready for automatic dismounting without further manpower requirements. An

* See drawing page 62.

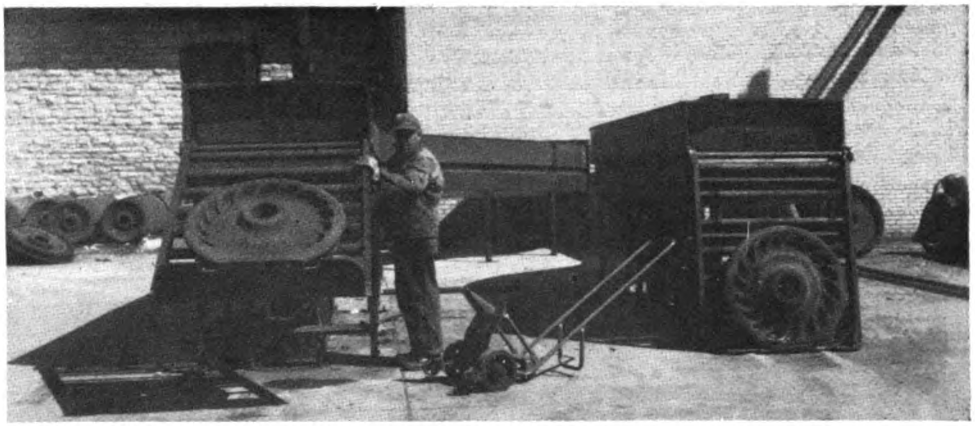


Gage blocks, micrometer calipers and special gages required for high standards of accuracy.



Double-end, cycling Magnaglo axle-test machine, set for testing diesel wheels.

How incoming new wheels, delivered by hand truck, are titled into covered and heated conveyors.



ingenious elevator *2* and conveyor *3*, run by the weight of the b. o. wheels and controlled by a small horsepower worm-drive, bring each pair of wheels in its turn to the 600-ton dismounting press *4* which is oil-gear-driven and has an interlocked hydraulic elevator.

Wheels are removed from axles on pneumatically controlled carts and roll down inclines into two scrap wheel chutes *5*. They are automatically raised in scrap wheel elevators and dispatched along overhead rolling inclines *6* through the shop wall to one of four pre-selected bins outside the shop. Good wheels for reclaiming are placed on a horizontal power-driven roller-wheel conveyor *10* and move automatically back to the boring mills.

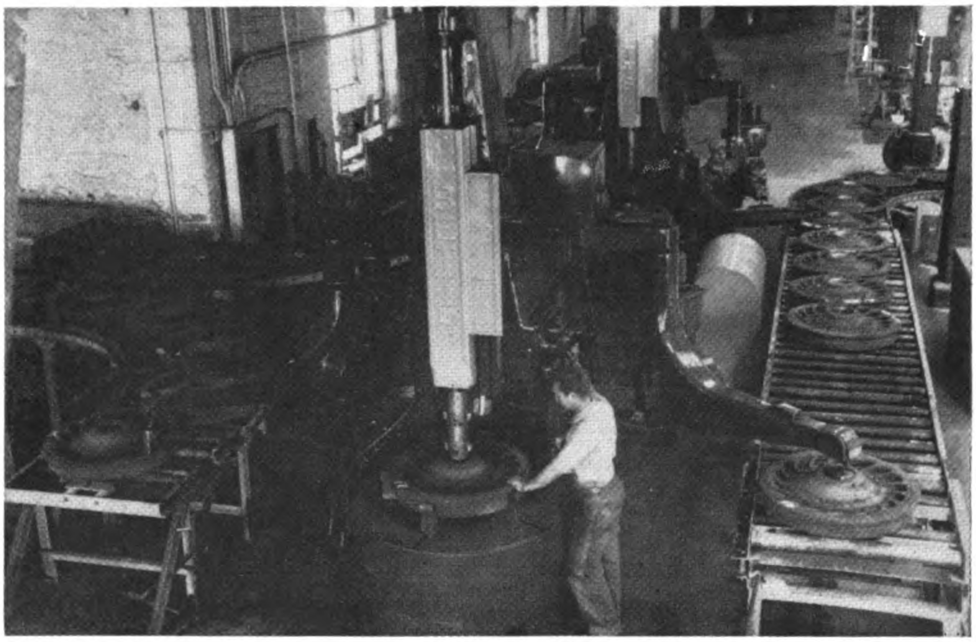
Each bad-order axle is raised by a floor air cylinder, electrically controlled and rolls into the cleaning machine *7*. After cleaning, it is kicked out and travels to the Whiton automatic cycling centering machine *8* and thence onto a pallet conveyor *9*. Axles may be handled on and off the pallet conveyor by the machinist who runs the centering machine, the machinists who run the Sellers end-drive axle lathes *11* or the Magnaglo machine *12*. The controls are electrically interlocked and any one of the above-mentioned mechanics can handle the axle, or number of axles into and out of his machine without leaving the machine. All axles after machining are rolled back on the pallet conveyor, inspected in the self-cycling Magnaglo machine, then sorted according to journal sizes and a list of sizes of wheel fits compiled and sent to the Betts boring mills *13*.

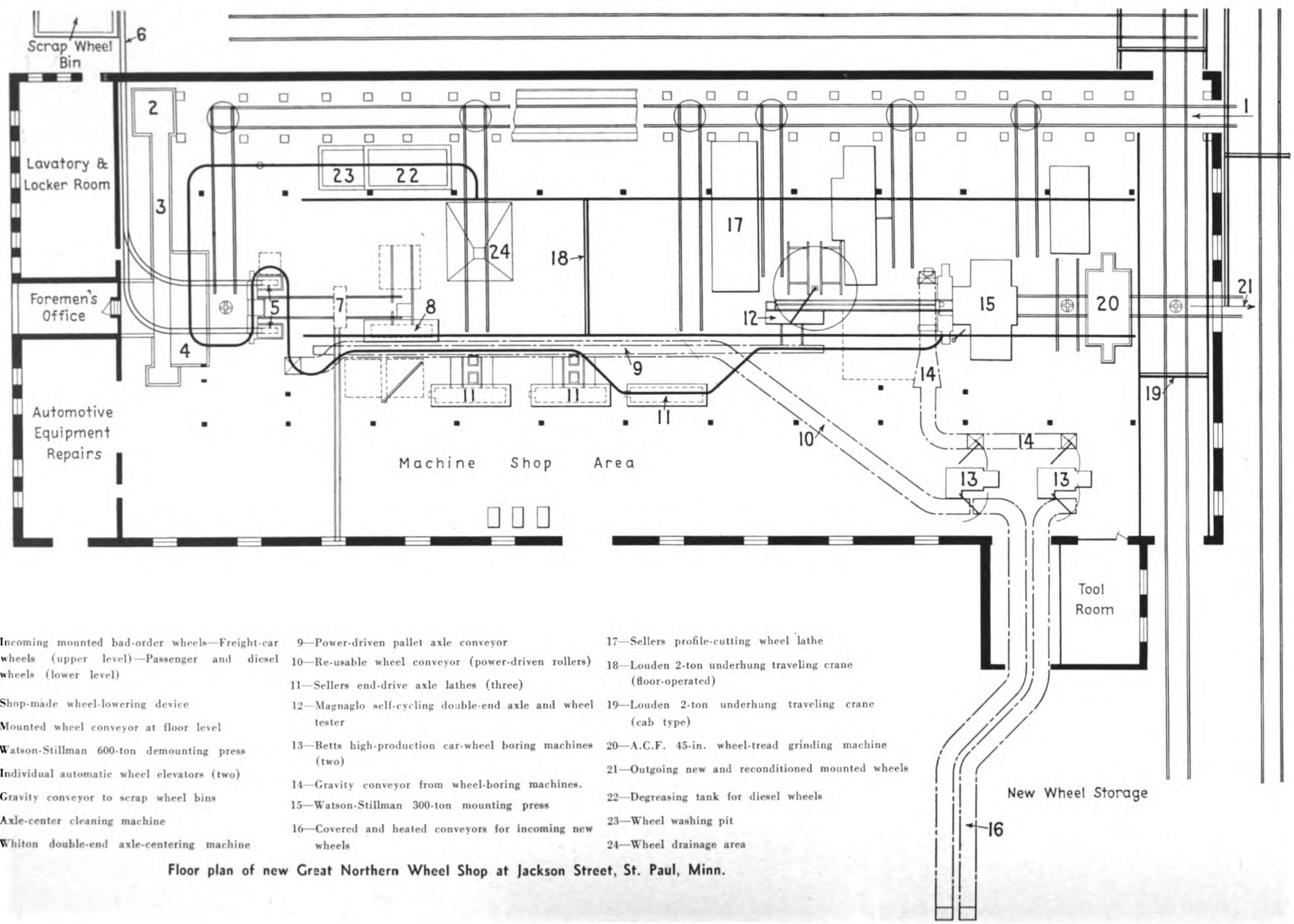
Wheels are bored to wheel-fit sizes and sent down a roller conveyor *14* to an automatic upender and pre-mounter, this being actuated when a pre-selected axle has been sent to the wheel press *15* on a self-powered transfer dolly. The operation of the upender and the transfer dolly is so timed that the pressman can mount one pair of wheels before another pair is pre-mounted waiting for him. The press-on press is a through-type with an oil-gear drive and electro-pneumatic control.

After the wheels are gaged, they roll along a track through the grinder *20*, about every fourth pair having the tread ground, as stated. These particular wheels are used on cars of Great Northern ownership. The wheels pass out of the shop at *21* and are double-deck loaded on wheel cars and sent to their respective destinations.

The shop is equipped with a large diesel wheel-cleaning tank *22* which uses C & H chemical solution at 200 deg. F. The wheels are washed at pit *23* and drained at *24*. Roller-bearing turntables require little effort to turn a pair of wheels for delivery to a number of accessory tracks in the shop. Two Yale 6,000-lb. fork-lift trucks are kept busy with miscellaneous lifting operations throughout the shop and an Orton 10-ton diesel crane equipped with a boom

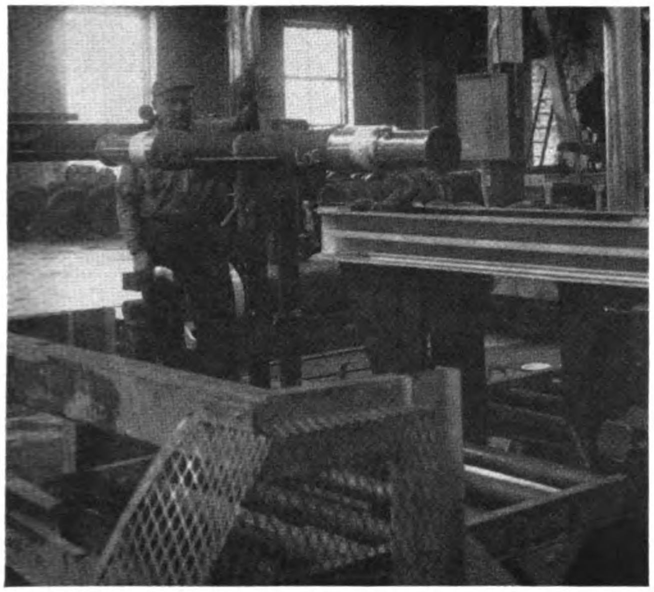
Gravity roller conveyors take wheels to and from the two modern Betts wheel-boring machines.



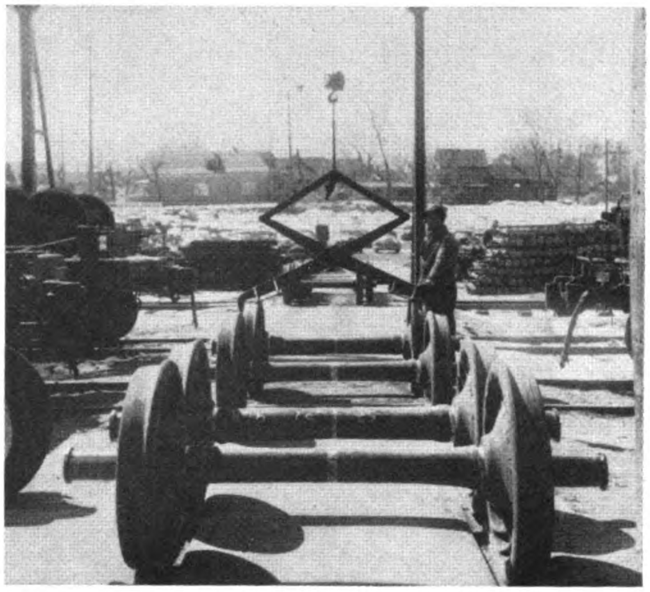


1—Incoming mounted bad-order wheels—Freight-car wheels (upper level)—Passenger and diesel wheels (lower level)
2 Shop-made wheel-lowering device
3 Mounted wheel conveyor at floor level
4—Watson-Stillman 600-ton demounting press
5—Individual automatic wheel elevators (two)
6—Gravity conveyor to scrap wheel bins
7—Axle-center cleaning machine
8—Whiton double-end axle-centering machine
9—Power-driven pallet axle conveyor
10—Re-usable wheel conveyor (power-driven rollers)
11—Sellers end-drive axle lathes (three)
12—Magnaglo self-cycling double-end axle and wheel tester
13—Betts high-production car-wheel boring machines (two)
14—Gravity conveyor from wheel-boring machines.
15—Watson-Stillman 300-ton mounting press
16—Covered and heated conveyors for incoming new wheels
17—Sellers profile-cutting wheel lathe
18—Louden 2-ton underhung traveling crane (floor-operated)
19—Louden 2-ton underhung traveling crane (cab type)
20—A.C.F. 45-in. wheel-tread grinding machine
21—Outgoing new and reconditioned mounted wheels
22—Degreasing tank for diesel wheels
23—Wheel washing pit
24—Wheel drainage area

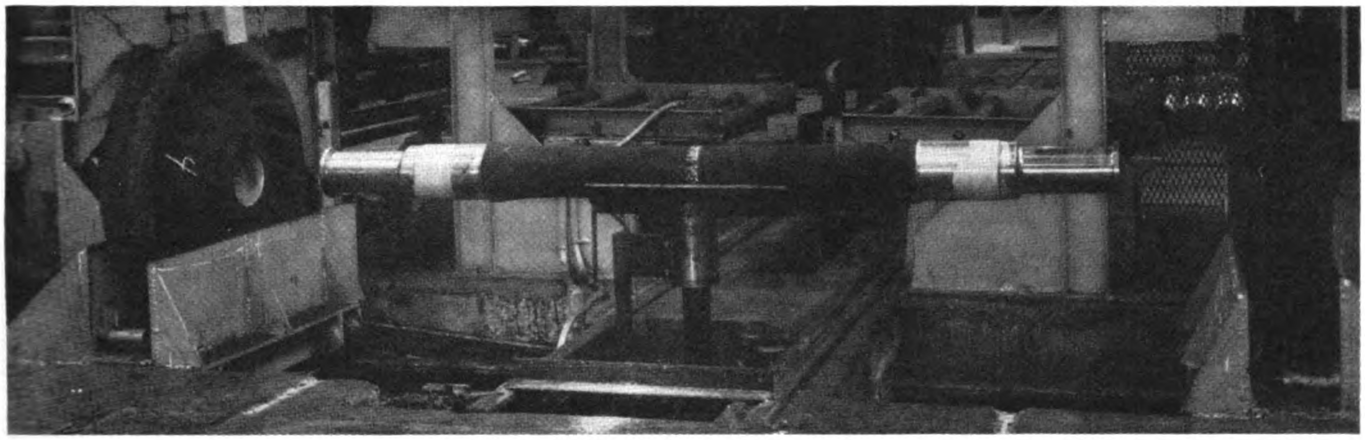
Floor plan of new Great Northern Wheel Shop at Jackson Street, St. Paul, Minn.



Power-operated transfer dolly which has just delivered an axle to the assembly position.



Outgoing track from the shop. Heppenstall tongs applied to lift a pair of wheels to the wheel car.



Wheels and axle ready to be assembled and rolled into the mounting press.

and electro-magnet loads out scrap car wheels.

Included in the revised shop facilities are a new foreman's office, a new lunchroom, locker and toilet room for the various workmen.

The shop is equipped with one 2-ton 29-ft. span underhung crane with floor control *18*, moving lengthwise of the shop, made by the Louden Machine Company, Fairfield, Iowa, and supplied by the Wm. H. Ziegler Company, Minneapolis, Minn. This crane is equipped with a hoisting unit made by Electro-Lift, Inc., Chicago, and arranged so it can operate when desired off the crane rail to the mono-rail system which in general extends in loops from the degreasing tank to the dismounting press, around the scrap wheel elevators and down the line of the axle conveyor with offset to only one of the axle lathes used mostly for passenger-car and diesel wheel work.

A second Louden 2-ton crane *19* with 17-ft. span and Yale & Towne electric hoist, but equipped with an operating cab, is installed transversely in the outgoing end of the shop and used for loading wheel cars. Two outside Chicago tram rail cranes with 40-ft. and 20-ft. spans for wheel handling are of 2-ton capacity and equipped with electric hoists supplied by the Chisholm-Moore Hoist Corp., Tonawanda, N. Y.

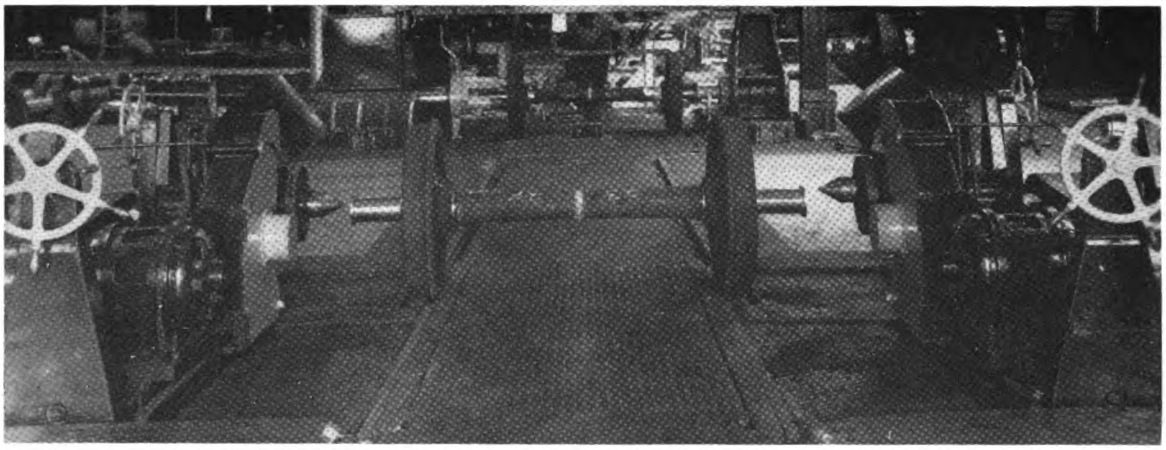
The pallet axle conveyor and roller-wheel conveyors used in the new wheel shop were manufactured to Great Northern specifications by the Standard Conveyor Company, North St. Paul, Minn. The two gravity roller conveyors *16*, on which new wheels enter the shop for boring, are enclosed and steam heated so that wheels will be at proper temperatures when they reach the boring mills.

The wheel upenders were designed and built by the Great Northern and utilize a series of interlocks, solenoids and electric stops, as well as air cylinders to up-end wheels and premount them on the axle prior to entering the mounting press.

The cranes use automatic lifting tongs supplied by the Heppenstall Company, Pittsburgh, Pa., and will not require the services of a hooker as the overhead craneman can hook onto the wheels and turn them at 90 deg. either for loading on wheel cars, or to unload onto the scrap wheel ramp.

A series of revolving brushes is located on the incoming bad-order wheel ramp, and distillate is circulated through a pipe system to the brushes and journals of the b.o. wheels as they roll along the ramp. Troughs catch the surplus distillate and return it to the pumps from whence it can be recirculated.

The hydraulic elevator of the 600-ton wheel press *4* travels 400 in. per min. to lower the wheels into the press



After mounting, the reconditioned wheels roll into and through an A. C. F. grinding machine.

and raise them back to floor level. By mounting this press on its side in the shop floor, the wheels can continue through and it is not necessary to reverse their direction. The machine has automatic cycling, a press-off speed of 32 in. per min. up to 400-ton, and 8 in. per min. up to 600 ton. It also has rapid traverse of 360 in. per min. The hydraulic equipment is oil gear and Vickers combination. The press is powered by a 50-hp. motor.

The elevator *2* which lowers the bad-order wheels from the storage ramp to floor level and transfers the wheels across the end of the shop and into the press-off machine, has been locally designed and built by Great Northern forces. The elevator and traverse mechanism can be actuated by the weight of a pair of wheels, but for exact spotting control, a small horsepower motor chain drives the mechanism. Electric stops and interlocks are so arranged that every time a pair of wheels is fed into the press-off machine, another pair of wheels is kicked into the elevator, while still another pair is traversed across the shop so that it can be fed into the press-off machine.

The two scrap wheel elevators *5* are push-button controlled and raise the wheels, as they come off the axles, 20 ft. overhead. The scrap wheels in turn run down a ramp *6* through an opening in the upper wall at the end of the building and outside the shop to bins approximately 50 ft. away. Air switches, which are manipulated by means of air solenoid valves, control the delivery of wheels to any one of four bins.

The Whiton centering machine *8* made by the Whiton Machine Company, New London, Conn., is a semi-automatic type with power-driven chucks built to Great Northern specifications and has automatic cycling heads. Axles are centered in this machine within an accuracy tolerance of .0025 in. from wheel seat in any direction and a tolerance of .015 in. in depth of center. The machine is complete with ways to roll the axle in, and an air-powered lowering and raising device which also kicks the axle out of the machine when the operation is finished. Each of the heads is powered with a 10-hp. motor.

The three axle lathes *11* are Sellers latest type dual-end-drive, with fillet-turning attachments, rollers and tool holders, and powered by variable-speed d.c. motors.

The Betts car wheel borers *13* are heavy-duty hydraulic-feed, equipped with anti-friction bearings for use with carbide tooling. Both borers have twin electric hoists to facilitate the handling of wheels.

The wheel lathe *17* to be installed is a Sellers 50-in. machine, powered by a 100-hp. motor and equipped for automatic profiling, with a built-in method of obtaining tape sizes. It has spring-loaded spindles to reduce the loading time so that the operator does not have to leave his station. The machine has a closed hydraulic system on the left head drivers with push button control, the operator pressing one button to traverse the right head, another button to chuck, and then is being ready to turn wheels. The machine is equipped to turn at a maximum speed of 24 r.p.m. The hydraulic equipment is Vickers. The machine has a vibrating chip pan to avoid the need of a helper in attendance at all times to remove chips.

The Magnaglo machine *12* has been rebuilt by the Great Northern to incorporate twin heads, an automatic feed and rejection system, also power turning of the axle for inspection. The headstocks have been raised so as to accommodate mounted wheels, and the cycling of the coils is automatic.

The car-wheel grinder *20*, furnished by the American Car & Foundry Co., has retractable heads. The grinder drive for revolving car wheels is mounted beneath the floor to permit the wheels to pass through when the grinder is not in use. The grinder is equipped with dual 50-hp. motors.

The 300-ton mounting press *15* is the inclined two-bar type complete with axle shifters and right and left automatic pusher blocks. The hydraulic rams are foot-controlled by electric-pneumatic switch. The press is a pass-through type and wheels can be gaged in any position.

In an attempt to more than meet A.A.R. standards of precision work and quality of finish, all key machines in the new Great Northern wheel shop are checked weekly to make sure they stay level and in adjustment. Axle lathe accuracy is kept to .001 in. in diameter with no tolerance for taper. Boring mills are held to .003 error in concentricity measured with a test wheel carefully ground all over.

All A.A.R. standard gages are used and checked periodically. Micrometer calipers, both dial type and direct-reading, are also checked for continued accuracy using standard micrometer gage blocks. Special gages for measuring journal length, collar height, wheel seat length and setting the heights of cutting tools are made easily available. Carbolloy insert cutting tools, supplied by the John C. Eide Company, Minneapolis, Minn., are used almost exclusively for machine tool operations in this shop. Tool inserts are accurately ground on an Anderson tool grinding machine using a small 6-in. diamond dust abrasive wheel. With tool and machine conditions maintained as nearly perfect as possible, tool breakage is minimized and high cutting speed with full accuracy assured.

Control of Corrosion in Locomotive Diesel Engines*

By A. C. Mengel
Chief Chemical Engineer, American Locomotive Company

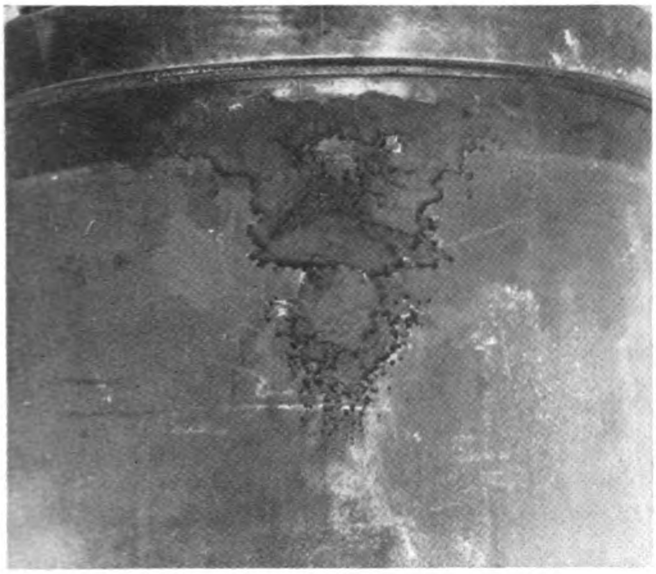


Fig. 1—Early type of cavitation-erosion on diesel-engine cylinder line.

THE greatest single corrosion problem in steam locomotive operation was embrittlement of the boiler plate resulting from then-current methods of treating boiler feedwater to prevent scale formation. Scale formation, which of course was not a corrosion problem in itself, reduced the heat-transfer efficiency of the boiler, raised the temperature of the metal wall, and led to serious danger of overheating and failure. This problem of scale formation was first attacked many years ago by treating boiler feedwater with an alkaline material (sodium carbonate).

While the use of feedwater treated in this manner greatly reduced if not eliminated scale formation, the dissolved oxygen in the treated water made the boiler susceptible to pitting and corrosion, further aggravated by the absence of scale, which had previously served to protect the boiler surface from this type of attack. In order to prevent pitting, therefore, it was found that comparatively high alkalinity of feedwater was necessary (pH 9.6).

However, this solution raised a new corrosion problem. The alkaline water, without preventive chemicals, attacked the boiler shell at grain boundaries in highly stressed areas, following concentration of the alkalies in seams and at leaks. Cold working of the boiler shell and other parts apparently increased susceptibility to this type of attack. Locomotive failures due to this involved type of corrosive action caused considerable loss to railroads before the problem was solved.

The ultimate solution actually consisted of four preventive measures: (1) proper maintenance of sulfate-carbonate ratio; (2) maintenance of a ratio of sodium nitrate to alkalinity in feedwater; (3) use of steel of lower tensile strength in boiler construction, so that stresses at grain boundaries would be lower; and finally (4) adoption of the all-welded, stress-relieved boiler. Today the wide use of the "embrittlement detector" developed by the U. S. Bureau of Mines is of great assistance in further controlling embrittlement, not only in steam locomotive boilers but also in stationary boilers.

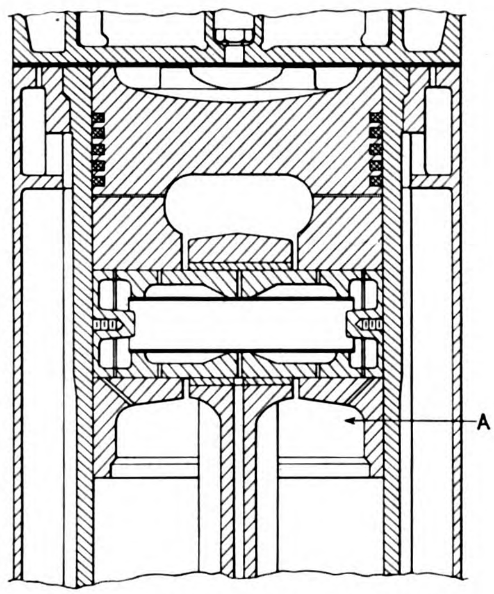


Fig. 2—Sections through cylinder of Alco six-cylinder diesel engine in locomotive service.

Embrittlement of the boiler plate had been such a vexatious problem that, although it was eventually solved, it hastened the general adoption of the diesel-electric locomotive in the United States.

* Presented at the Third Railroad Corrosion Conference, Harbor Testing Station of the International Nickel Company, Wrightsville Beach, N.C., May 6-8, 1952.

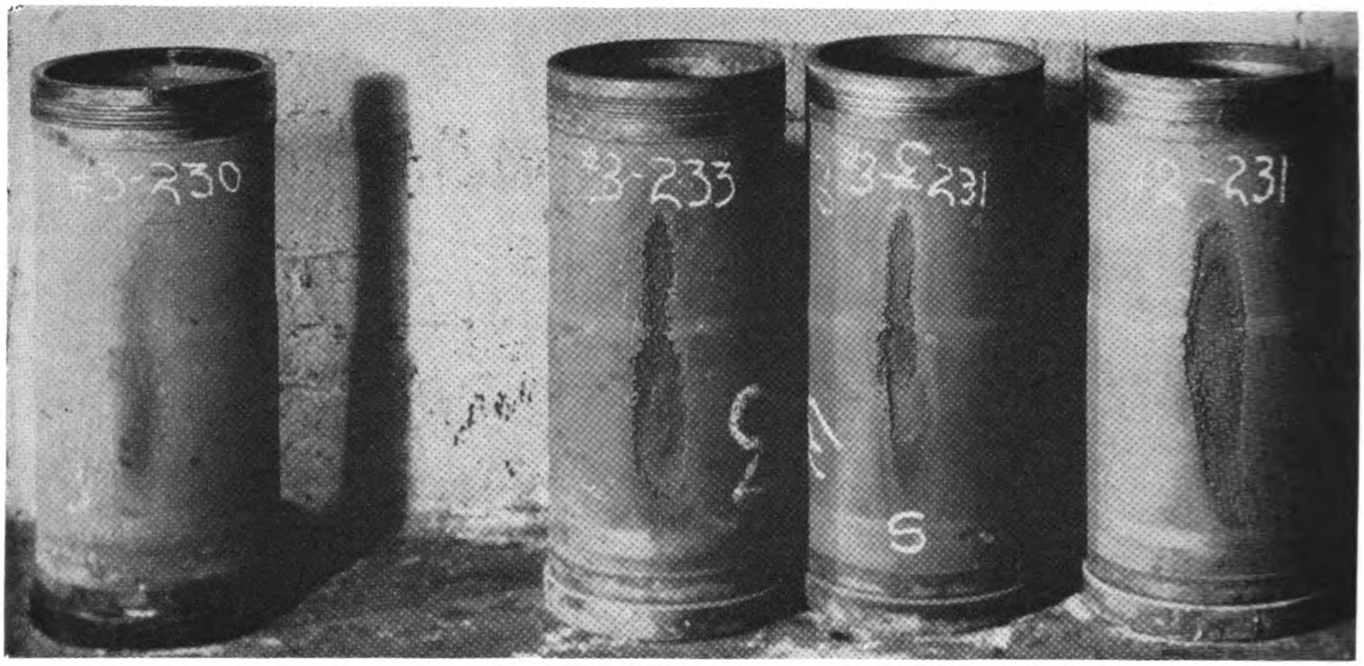


Fig. 3—Type cases of corrosion on cylinder liners. Liner at left shows retarded corrosion due to addition of chromates to cooling water; liners at right show advanced corrosion due to absence of chromates. Single notch in baffle used in both cases. Compare Fig. 5.

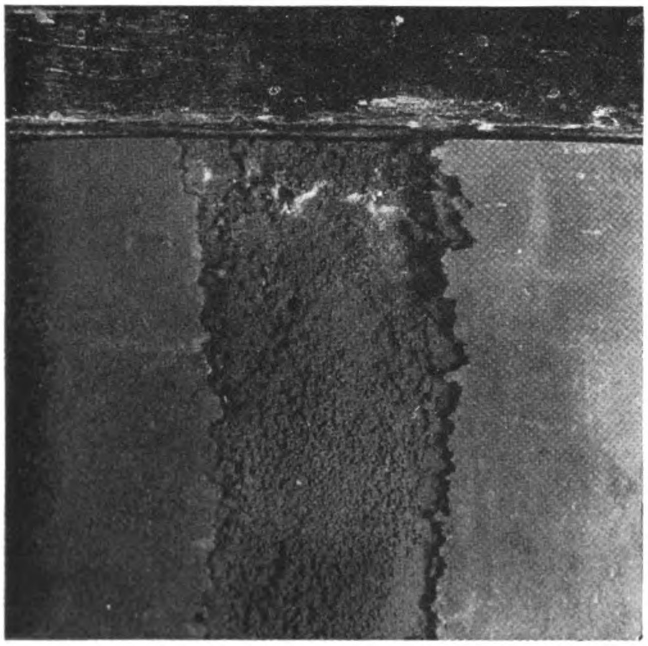


Fig. 4—Detail of same type of corrosion shown in Fig. 3.

Diesel-Electric Locomotives—Early Corrosion Problems

American Locomotive Company experience with diesel-electric locomotives goes back to 1924, when Alco built the first successful diesel-electric for railroad use—a 300 hp. switcher equipped with Ingersoll-Rand diesel engine and G.E. traction equipment. This was a six-cylinder, air-injection type with 14 in. by 16 in. cylinders. In 1928, when Alco acquired the McIntosh & Seymour diesel engine plant at Auburn, N.Y., this pioneer engine was replaced with a six-cylinder, 9½ in. by 10½ in. diesel rated at 300 hp. and 550 r.p.m. (later increased to 700 r.p.m. without supercharging). The following year the Auburn engineers initiated the design of a six-cylinder, 12½ in. by 13 in. diesel engine, developing 600 hp. at 700 r.p.m.; also without supercharging. These engines were installed in new locomotives then being built at Schenectady.

In 1935 Alco built its first supercharged diesel engine, which was placed in locomotive service in 1936. This was a six-cylinder, 12½ in. by 13 in. solid-injection engine supercharged to 900 hp. at 700 r.p.m. Later, about 1938, this design was increased to 1000 hp. at 740 r.p.m., while the unsupercharged diesel was increased to 660 hp. at 740 r.p.m. In 1943 the first Alco V-12 engines were built for test at Auburn and were later (1946) installed in locomotives for delivery to various railroads. In 1946 also appeared the Alco V-16 diesel engine, which, like the V-12, had 9 in. by 10½ in. cylinders.

As indicated above, the early diesel engines were of low horsepower, and successive types were increased in horsepower rating by supercharging. The supercharging was accomplished with practically no change in the cooling systems, except to increase the velocity of the cooling water.

Corrosion in Alco diesel engines was first evidenced by pitting and formation of ferric hydroxide on the cylinder-liner surfaces. This naturally caused concern, but did not result in engine failure. The first failures of liners to come to our attention at Alco were due to what would be called "cavitation erosion" today (Fig. 1). This action occurred at the upper end of the liner, just beneath the port into the cylinder head. The water, used without treatment, had a pH of about 6.2 to 6.5. At that time, it should be noted, chromates were not available as they are today.

About 1939, in order to improve cooling of engines, Alco designed a cylinder block containing a baffle which was located in the area designated by the letter A in Fig. 2. One notch on this baffle permitted water to flow

to the upper compartment. After about a year of field operation with this baffle, Alco began to receive reports of corrosive attack on cylinder liners. This type of attack, which resulted in perforation of the liner, was quite new to us at the time. Typical cases of this type of corrosion on actual cylinder liners are shown at the right in Fig. 3. A close-up detail of the same type of corrosion is shown in Fig. 4.

Methods Used by Alco to Combat Cylinder-Liner Corrosion

Because of the considerable number of diesel-electric locomotives involved in this type of corrosion, the Alco laboratory at Schenectady undertook, in 1940-1941, a planned research program, beginning with attempts to reproduce this form of attack in the laboratory. Tests of from four to six weeks' duration were carried out. Water with all conceivable conditions of pH, oxygen saturation, deaeration, hardness, velocity, temperature, and jet action were used. Although we had high and low corrosion rates in these tests, we could not produce the type of attack characteristic of the failures reported by the railroads.

At this point, a brief review of liner conditions after failure may be of interest. Alco's first observation was that there was no calcium carbonate scale on liner surfaces where pitting and corrosion had occurred extensively. A drop of dilute hydrochloric acid produced no effervescence. In this regard, we had studied at one time the application of calcium carbonate to the cooling systems to build up a protective film on liner surfaces.

The second observation was that, while total carbon of drillings from corroded liners was about 3.16 per cent, the total carbon values of the honeycombed areas around the point of failure were about 2.65 per cent. Apparently graphitic carbon was removed faster from liner surfaces than was the cast iron itself.

Use of Chromates in Diesel Radiator Cooling Water

Attempts to reproduce cylinder-liner corrosion failures in the laboratory were abandoned after about 15 months of work. Our conclusions were that there were conditions present in diesel locomotive engines that could not be duplicated in bench type laboratory tests. The author suspected that there were hoop type stresses which projected action (probably similar to hydraulic action) against liners in the region close to the notched hole in the baffle referred to above.

During this period, while the laboratory was attempting to duplicate the corrosive action observed in the field, Alco's engineering department had increased the number of holes in the baffle, thus reducing the water velocity at the notch. This change in baffle design was made in 1941.

At about the same time, both laboratory and engineering departments concluded that treatment of the water with chromates was the only solution to cylinder-liner corrosion, and had convinced the various railroads to this effect. (Fig. 5 shows the effect in reducing corrosion by adding chromates without increasing the number of holes in the baffle. Compare with Fig. 3, right, which shows extent of pitting and honeycombing due largely to impingement of water *without* chromates added.)

These two measures—reducing the velocity of the water by mechanical means, and treatment of the water with chromates—resulted in great reduction of corrosion, and the laboratory's work in this direction was considerably lightened. Shortly thereafter several technical papers were published which indicated that the observed type of corrosion-erosion could be reproduced by high-frequency vibrations of test specimens in water.

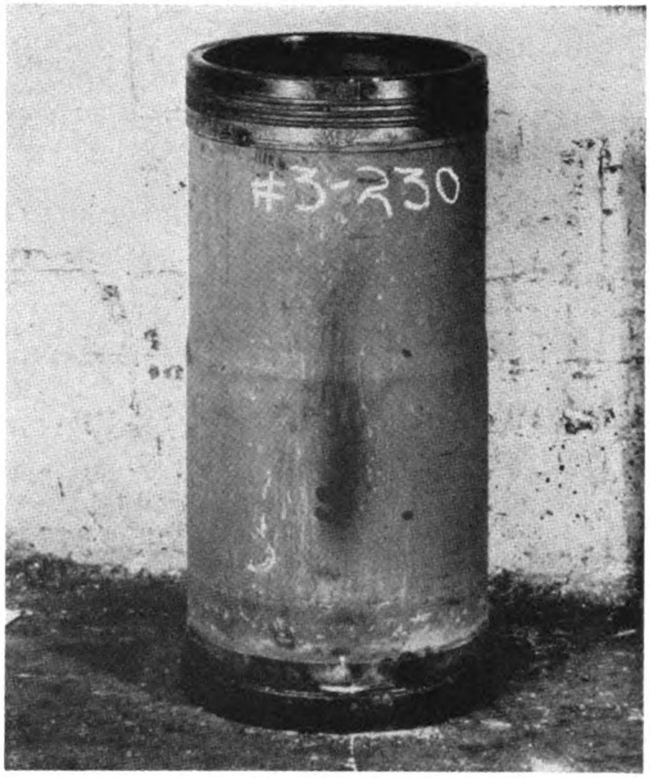


Fig. 5—At left the cylinder liner shown in Fig. 3. Without change in baffle design, corrosion was retarded solely by addition of chromates to cooling water, with water velocity remaining constant.

As has been pointed out by Wilkes* and others, chromate type corrosion inhibitors protect metal surfaces from corrosion through electrochemical and mechanical action. This action is explained as follows: "Bright iron surfaces exposed to air immediately form invisible oxide films, which are relatively porous. When water contacts the iron surface, ferrous ions seep outward through the pores of the oxide film and combine with hydroxyl ions in the water, forming ferrous hydroxide. Once in solution, the iron eventually precipitates as an insoluble ferric hydroxide sludge. When alkali chromates are present in the cooling water, ferrous ions starting outward through the pores interact with chromium ions to form a mixed precipitate of ferric hydroxide and chromium hydroxide. This co-precipitate forms in the pores of the iron oxide film, sealing the pores and effectively stopping solution of iron.

"With proper chromate concentrations, the protective film is virtually continuous and uniform over the surface of the metal. The film may be cracked and removed by stresses, or by scouring action of water at points of high liquid velocity, but will continuously repair itself, if the chromate concentration in the cooling water is maintained sufficiently high in relation to other salts. However, if the chromate concentration is not sufficient to produce a blocking mixture in the oxide film pores, but merely causes precipitation of mixed oxides in the form of a loose, visible blister which does not contact the metal surface, the inhibitor may be excluded from susceptible corrosion spots, allowing accelerated corrosion to proceed beneath the film."

Alco's first recommendation for use of chromate was

* J. F. Wilkes, Water Conditioning for Diesel Cooling Systems, Southern Railway Diesel Club, Dallas, Tex., Meeting, October 10, 1950.

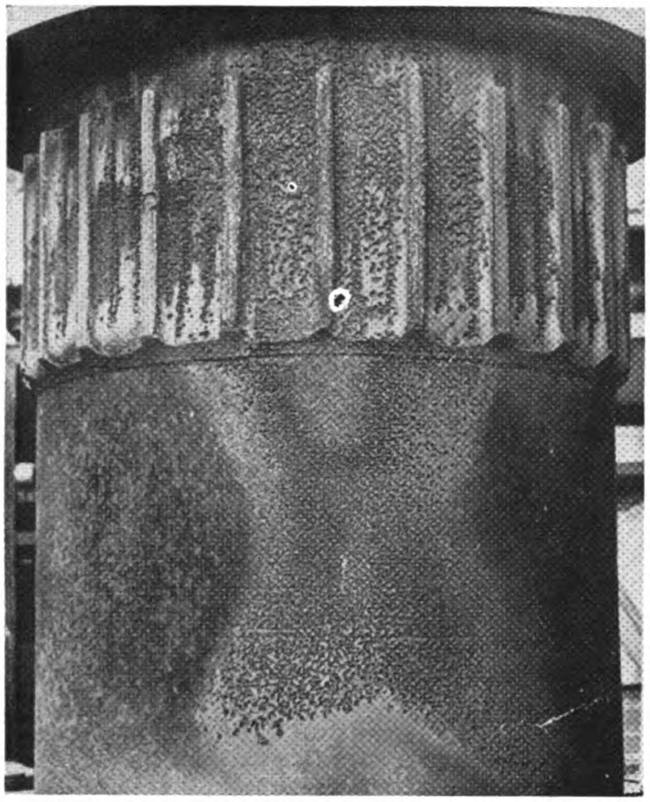


Fig. 6—Extent of cylinder-liner corrosion possible without chromate treatment after approximately 70,000 miles of service in diesel-electric locomotive.

that 500 parts per million should be sufficient. No particular reference was made to pH factor. However, because of difficulty experienced by railroads in maintaining this concentration (due to leaks, etc.), the figure was increased to 1,000 ppm. This concentration was again increased to 2,000 ppm minimum when Alco brought out the 9 in. by 10½ in. V-12 diesel engine for locomotive use in 1946, the pH then being from 8.5 to 9.5.

At first there were many instances of complaints that cylinder-liner corrosion continued to exist despite careful control of chromates. Gradually, as more and more precise control was achieved by the various railway systems, these complaints decreased in frequency until such instances today are quite rare indeed.

Alco's years of experience in this field indicates that if corrosion occurs with the use of chromate, the reason is that control of chromate has been allowed to lapse. Forty-eight hours with low chromate or no chromate at all can result in corrosion of consequence. Fig. 6 shows the extent of corrosion possible without chromate treatment after approximately 70,000 miles of service.

Alco is constantly aware of the importance of using only chromate-treated water in the cooling systems of new diesel locomotives, and provides chromate-treated water for break-in testing of all its diesel engines. The company has also set up two treating stations in its diesel locomotive shops so that only properly treated water can be used to fill cooling systems of new locomotives. In addition, Alco checks chromate content of water in systems of new locomotives immediately prior to shipment. All these precautions are of vital importance, for unless chromate control is maintained from the very beginning, corrosion of cylinder liners may become initially established in the form of pitting of the liner. It is much more difficult, once this has happened, to provide subsequent corrosion protection with chromates. Accordingly, the railroad's maintenance personnel should make every effort to provide continuous chromate protection from the moment of delivery of the new locomotive.

Precautions To Be Observed in Handling Chromates

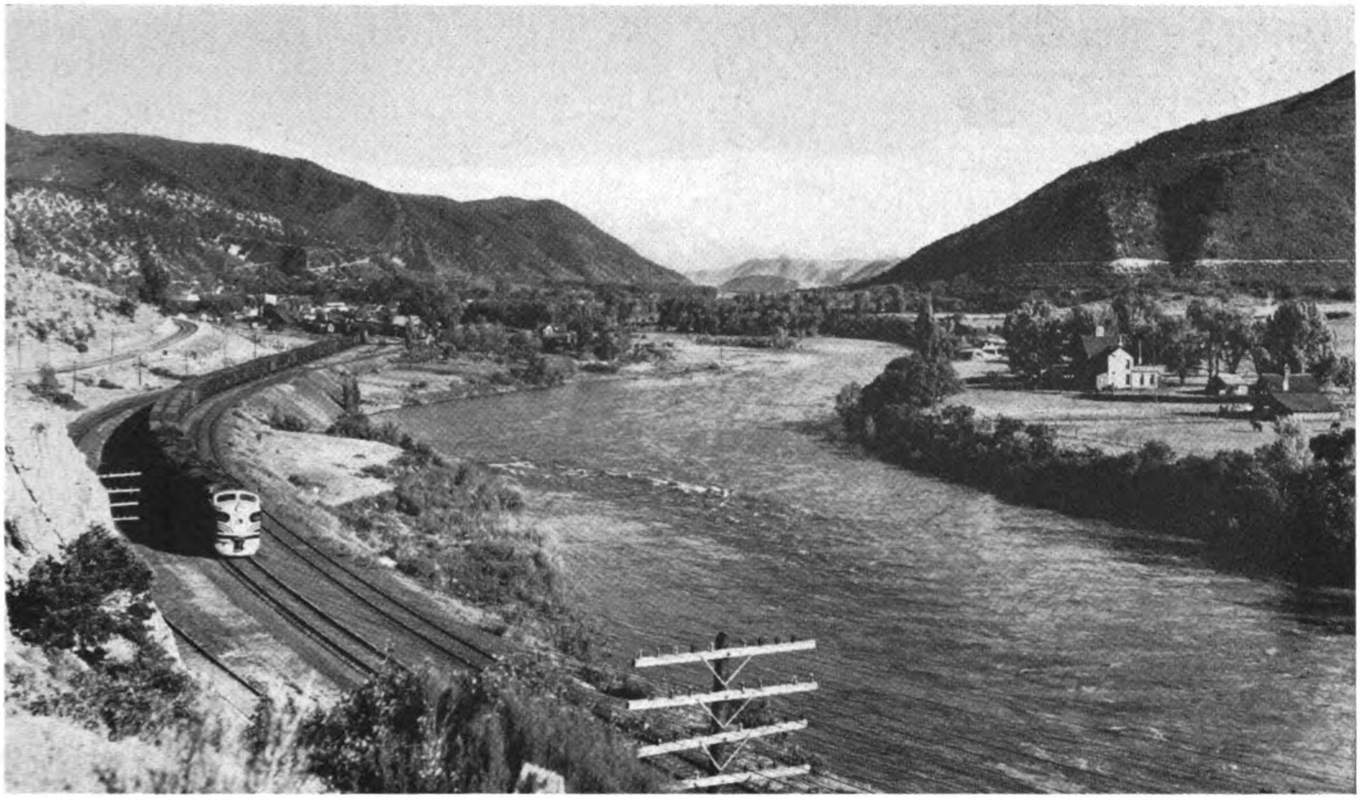
The active agent in corrosion-inhibiting cooling fluids of the chromate type is sodium bichromate, which is present in the treated radiator water in about .20 per cent concentration. It is the only successful corrosion preventive in use at the present time on diesel-electric locomotive cooling systems, and will probably continue in use for a good while. Among its advantages are (1) gives visual evidence of presence in water; (2) the concentration of chromate is easy to determine and control; (3) it is inexpensive; (4) it produces the required results.

However, chromates have one important disadvantage in that they require careful handling because of their toxicity. The *Journal of the American Medical Association* for November 17, 1951, reported that "chromate dermatitis, resulting from contact with diesel locomotive radiator fluid, constitutes an industrial hazard of growing importance in the railroad industry. Its occurrence should be brought to the attention of industrial surgeons, dermatologists, and safety engineers, so that it may be promptly recognized and proper preventive and protective measures instituted."

In the Alco shops at Schenectady and Auburn, N.Y. we had some experience with chromate dermatitis in the early days following its introduction. Once the condition was recognized and the dermatitis treated medically, the hazard was immediately corrected. Safety measures included a short course of training for operators handling the chromate, provision of better equipment and working conditions, and facilities for washing in close proximity to the working area. Manufacturers of chromates have published safety recommendations which are readily available and which have proven very effective not only in handling chromates but also in the large-scale handling of much stronger concentrations than those encountered in railroad work.

In addition, measures have been taken by chromate manufacturers to reduce the dust hazard by producing the chemical in the form of pellets or cubes. At least one manufacturer has available automatic treating stations from which only properly treated water can be taken, thus greatly minimizing problems of handling. These plants are simple, low-cost adaptations of wayside feeders used so successfully in steam locomotive service. A short course of lectures to people handling this chemical should also prove very helpful. Alco laboratory workers, with proper instruction and the exercise of common cautions, handle much more toxic chemicals every day with no difficulty whatever. Railroad shop personnel, unless there is extreme hypersensitivity or pre-existing allergy, can, it is felt, handle chromates with complete safety.

In closing, it may be added that all of the present producers of corrosion-inhibiting cooling fluids are at present studying and making tests of alternate materials that can be substituted for chromates in the event that either the supply of chromates may be curtailed in the foreseeable future, or that the problem of toxicity may become serious enough to warrant use of a substitute for chromates. At the present time, however, there is no definite indication that either of these eventualities will materialize.



Diesel freight west of Glenwood Springs, Col.

D. & R. G. W. Increases Operating Efficiency with Diesels

Effective use of new power on this road is largely due to controlled lubrication and good maintenance

No small part of the credit for an operating ratio of 67 per cent on the Denver & Rio Grande Western in 1951 is due to the successful use of diesel motive power, made possible by effective maintenance, controlled lubrication and close operating-mechanical teamwork. As of January 1, 1952, the diesel locomotive inventory included 40 switchers, 9 road-switchers, 30 four-unit and 2 three-unit road locomotives, a total of 81 locomotives, or 175 units. A number of units are equipped with steam generators and used in passenger service when necessary. Thirty-six new EMD diesel units are expected to be delivered by the middle of the year.

Operation in the mountainous country traversed by this railroad, with mainline elevations up to 10,221 ft. at Tennessee Pass, maximum grades of 2, 2½ and 3 per cent, tunnels galore culminating in Moffat, and multitudinous curves up to 12 deg. presents difficulties and costs in no way comparable with those of more level roads. One of the principal contributions of the diesel locomotive has been its ability to handle increased tonnage from one end of the line to the other with minimum helper service and no stops at 15-mile intervals for wheel-cooling on down grades such as were required before the advent of dynamic brakes.

As a matter of fact, the diesels now take safely down hill at reasonable speeds at least as much tonnage as they can haul up. Freight trains delivered to the D.&R.G.W., possibly by three-unit diesels, are handled over the system by four-unit locomotives with one or more helpers cut in usually at only two points, eastbound or westbound, namely, grades to Soldier Summit in Utah, and either Tennessee Pass or Moffat Tunnel, Colo.

Helper service is supplied by 1,500-hp. road switchers and three- or four-unit diesels as required by train length

On the main line at Thistle, Utah, between Price and Provo

and grade, also by some steam locomotives. As many as six or seven diesel units are often double headed in pulling trains up hill, but when more power is required, one four-unit locomotive is operated at the head end, another is cut in about 25 cars back and, if the tonnage or severity of the grade makes it necessary, still another, or a steam locomotive, may be cut in just ahead of the caboose.

D. & R. G. W. SYSTEM FREIGHT-TRAIN PERFORMANCE

	1951	1950	1948	1941*
Freight train-miles	4,037,986	4,067,534	4,739,257	4,696,283
Gross ton-miles produced (000)	12,015,591	10,355,365	10,841,180	8,387,748
Net ton-miles produced (000)	5,782,825	5,066,955	5,387,026	3,585,858
Average train speed, m.p.h.	17.1	17.0	16.5	16.5
Average gross train load, tons	2,976	2,546	2,288	1,786
Gross ton-miles per train-hour	50,847	43,276	37,848	29,542

* Includes the former Denver & Salt Lake Railway Co.

PERFORMANCE OF DIESELS IN FREIGHT SERVICE, WEEK ENDED FEBRUARY 24, 1952

	Excluding units held	Including units held
Average number of locomotives in service	26.1 ss	27.9
Potential hours	4,380	4,686
Mechanical time held, hr.-min.	423-5	729-5
Time available, hr.-min.	3,956-55	3,956-55
Per cent availability	90.3	84.4
Time available not used, hr.-min.	283-30	283-30
Time used, hr.-min.	3,673-25	3,673-25
Per cent utilization	83.9	78.4
Per cent used of hours available	92.8	92.8
Unit time out of service, hr.	648	......
Unit miles lost	8,885	......
Total locomotive miles	60,099	......
Average miles per day	8,585	......
Average miles per day per locomotive	329	......

Improvements in diesel locomotive engine and electrical equipment, plus the application of radiator water spray systems for engine cooling in tunnel operation, permit handling more tonnage and at lower speeds on grades than was formerly practicable. At one time, one four-unit diesel would move 1,800 tons westbound out of Denver up the 2 per cent grades to the Moffat Tunnel, but this train load has now been stepped up to 3,400 tons and the minimum continuous safe speed on grades without traction motor overheating has been decreased from 14 m.p.h. to 10.5 m.p.h. Westbound trains out of Pueblo are operated up to 4,800 tons.

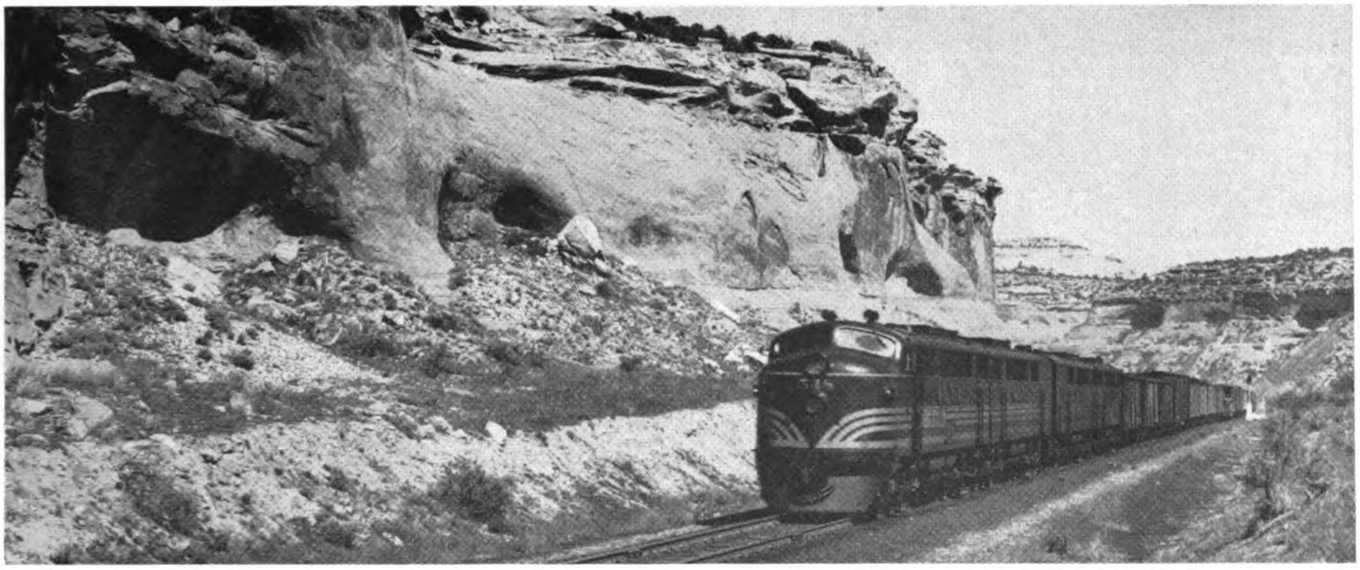
Eastbound via Denver, 5,000-ton trains are handled over the road with helper service for a total of only 38 out of 570 miles. On one day recently, an average of 112 cars per train were handled on the Salt Lake Division, and the average for the system in both directions was 84 cars. During February the average train load for the system was 3,199 tons and the gross ton-miles per train hour 51,785, a continued improvement over exceptionally favorable operating results in 1951.

Record Operating Results

As shown by a table in its annual report the D.&R.G.W. made the greatest improvement in freight train performance during 1951 of any year in the history of the company. Whereas freight-train miles decreased 14.0 per cent from the 1941 figure, gross ton-miles increased to over 12 billion, reflecting a 43.3 per cent increase in volume of business handled. Net ton-miles followed a similar pattern. The average gross train load increased 66.6 per cent over 1941 to 2,976 tons in 1951, and this in spite of a slight stepping up of average train speeds to 17.1 m.p.h. The result was an increase in gross ton-miles per train-hour from 29,542 in 1941 to 50,847 in 1951, or 72.1 per cent, an accomplishment largely attributable to diesel power which hauled 83.0 per cent of the tonnage last year.

Three tables showing diesel performance in road-freight and helper service, also shopping time and terminal delays for the fairly typical weekly period ended at 11.59 p.m., February 24, further confirm the effective use being made of diesel power on this road. With an average of 26.1 four-unit freight diesels in service, the ratio of hours available for operation to total hours in the period was 90.3 per cent and the ratio of hours actually used to total hours was 83.9 per cent. Even including units held out of service for one reason or another these percentages dropped to only 84.4 and 78.4 respectively.

The D.&R.G.W. tries not to fool itself with misleading statistics, hence the insistence on including in utilization figures freight units held out of service for repairs or other reasons. Accurate records are kept of all hours locomotives are not available for service and unit miles lost.



In Ruby Canyon near the Colorado-Utah state line

COST OF DIESEL LOCOMOTIVE REPAIRS—CENTS PER MILE

	1951	1950
January	48.76	37.41
February	34.34	43.73
March	40.34	38.10
April	38.22	39.64
May	39.82	34.09
June	41.01	31.87
July	36.18	42.43
August	37.07	40.57
September	36.15	34.65
October	37.32	39.60
November	38.98	39.01
December	48.88	50.22
Average	39.76	39.35

UTILIZATION OF GP (GENERAL PURPOSE) DIESELS, WEEK ENDED FEBRUARY 24, 1952

	Roper-Helper, Utah	Burnham-Phippsburg, Colo.
Locomotives in service	2	7
Potential time, hr	336	1,176
Mechanical time held, hr.-min	38-45	105-45
Time available, hr.-min	297-15	1,070-15
Per cent availability	88.5	91.0
Time available not used, hr.-min	8-30	235-50
Time used, hr.-min	288-45	834-25
Per cent utilization	85.9	71.0
Per cent used of hours available	97.1	78.0

DIESEL LOCOMOTIVE DETENTION AT TERMINALS, WEEK ENDED FEBRUARY 24, 1952

Terminal	Loco-motives	Mech. delay Hr.-Min.	Trans. delay Hr.-Min.	Average per locomotive Mech. Hr.-Min.	Trans. Hr.-Min.
Burnham	48	258-15	113-35	5-23	2-22
Pueblo	35	41-20	78-20	1-11	2-14
Grand Jct	39	78-25	69-15	2-01	1-47
Salt Lake	38	45-05	22-20	1-11	0-35

Total locomotive miles in the period mentioned equalled 60,099, giving an average per day of 8,585 and average per locomotive per day of 329. Freight locomotives worked the equivalent of 50 days in local and helper service during this period and made 9,454 miles, all included in the total mileage mentioned. Deducting these leaves an average of 18.9 locomotives making 383 miles a day in through-freight service.

The table of terminal delays in the week ended February 24 shows delays due to mechanical work varying from 1 hr. 11 min. to 5 hr. 23 min. at four major terminals, also transportation delays at these four points ranging from 35 min. to two hr. 22 min. Needless to say this table is watched carefully by supervisors in both departments as well as top railway management.

A fourth table covering GP (general-purpose) diesel locomotive performance in helper and local freight service during the week ended February 24, also discloses the highly creditable figures of 88.5 per cent availability and 85.9 per cent utilization of two locomotives in helper and switching service and 91 per cent availability and 71.0 per cent utilization of seven locomotives in local freight service. The last two figures of 97.1 per cent and 78.0 per cent in the table reflect the success or difficulty of the operating department in using all of the locomotive service hours placed at their disposal by the mechanical department. D.&R.G.W. experience indicates that it is possible to get only about one-half as many miles per week or month with helper locomotives as with those used in through-freight service. This is approximately true with GP locomotives hauling local freight.

Business Volume Vital Factor

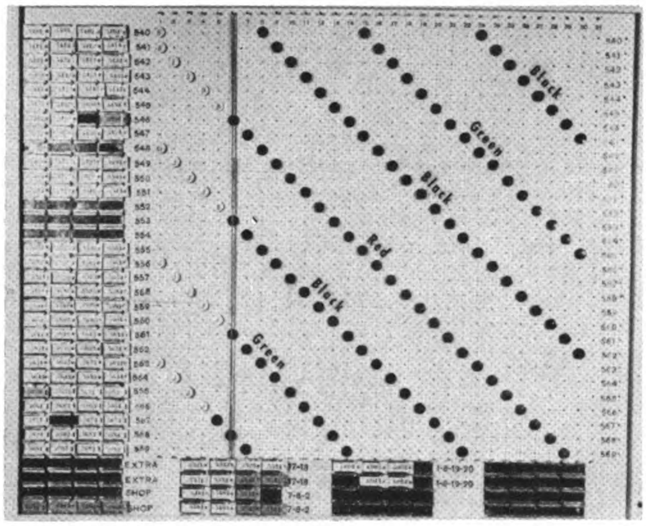
The close interdependence of operating efficiency figures and tonnage available for movement is again demonstrated by D.&R.G.W. records. In the week ended August 20, 1951, for example, only 1,120 unit miles were lost and the miles per locomotive per day in through-freight service averaged 397. In explanation: "This performance, far above any previous record, was brought about by having business available at all terminals with very little delay awaiting traffic to move." Conversely, a less favorable showing in the more recent week ended March 17 elicited the following statement: "Performance was adversely affected by a sudden drop in through business during the week, making it necessary to divert diesels to more locals, drag trains and helper service."

As previously suggested, the kind of country a railroad operates over has an important influence on operating costs and performance, and the D.&R.G.W. is no exception to this rule. Consequently any comparison with less mountainous roads, based on 1,000 gross ton-miles of freight traffic handled, fails to take into account the fact

DIESEL FREIGHT SERVICE—OPERATING COMPARISON, 1951

	First quarter		Second quarter		Third quarter	
	D. & R.G.W.	Average all roads*	D. & R.G.W.	Average all roads*	D. & R.G.W.	Average all roads*
Operating Costs and Consumption per 1,000 G.T.M.						
Operating costs in cents:						
Repairs	17.07	11.49	14.17	11.58	12.05	11.47
Fuel	24.81	17.17	22.89	16.63	22.03	16.15
Lubricants	1.50	.90	1.37	.86	1.44	.88
Total	43.38	29.56	38.43	29.07	35.52	28.50
Consumption in gallons:						
Fuel	2.60	1.82	2.40	1.75	2.31	1.71
Lube	.025	.017	.022	.016	.022	.017
Operating costs and Consumption per Unit Mile						
Operating costs in cents:						
Repairs	12.65	12.82	11.23	13.12	9.60	13.09
Fuel	18.38	19.18	18.13	18.70	17.56	18.64
Lubricants	1.11	1.02	1.08	.96	1.15	1.02
Total	32.14	33.02	30.44	32.78	28.31	32.75
Consumption in gallons:						
Fuel	1.93	2.02	1.90	1.95	1.84	1.93
Lube	.018	.019	.017	.018	.018	.019

* As taken from Report, prepared by EMD.



Thumb-tack colors:

Black — Weekly inspections
Green — Semimonthly inspections
Red — Federal inspection
White — Work completed

Diesel locomotive control board or maintenance calendar

that this heavy tonnage of load and equipment has to be moved around many sharp curves and lifted over one or more mountain ranges.

This statement is borne out by operating comparison reports which show D.&R.G.W. performance to be below average in gross tons hauled per unit and practically all items of cost per 1,000 gross ton-miles, but definitely above average in locomotive utilization and almost all costs per unit mile, or per gallon of fuel consumed. For example, in the third quarter of 1951, the gross tons per unit on the D.&R.G.W. were little more than three-quarters of the general average; the cost of repairs, fuel and lubricants per 1,000 g.t.m. was 35.52 cents compared with 28.50 cents average for all roads.

On a unit-mile basis, for the same period, however, the cost of repairs, fuel and lubricants was only 28.31 cents for the D.&R.G.W. compared with a national average of 32.75 cents. The consumption of fuel per unit mile on the D.&R.G.W. was 1.84 gal. compared with an average of 1.93 gal.; and lube oil, .018 gal. compared with .019 gal.

Without an effective diesel locomotive inspection and maintenance schedule, the motive power results described could not have been achieved. The program for this work follows closely recommendations in EMD pamphlet No. 1704, Revision L, and both operating and mechanical forces work together not only in using the locomotives intensively but making periodic inspections and repairs essential for this modern motive power to meet the exacting demands made upon it.

The principal departure from general practice in D.& R.G.W. diesel maintenance methods is the use of a spectrograph in the central laboratory at Denver to analyze crankcase oil and disclose mechanical conditions which need correction and, in fact, tell when oil changes are necessary. Drain periods have been extended to 300,000 and 400,000 miles or more with no apparent ill effects and, in fact, more reliable service, reduced maintenance and large savings in lubrication costs.

The D.&R.G.W. has pioneered not only in use of the spectrograph which gives a qualitative and quantitative analysis of lubricating oils, but has only recently installed at the Denver laboratory the first railroad-owned electron-microscope for research in (1) improved and less costly diesel locomotive fuels and dispersants, (2) lubricating oil types and additives which last longer and permit less engine wear, (3) acceptance testing of both fuel and lubricating oils on delivery.

The diesel control board or maintenance calendar, illustrated, is the basic device used in telling when diesel locomotives are due for inspection and repairs. In the D.&R.G.W. locomotive numbering system, the first three digits generally give the locomotive number and the fourth digit the unit number. Removable colored thumb tacks are inserted in the master board to show the dates when individual locomotives and units are due for various types of federal inspection such as monthly, quarterly, semi-annual and annual. In addition, there is a form DM-1 showing work to be done in short point checks of through engines, a slightly longer DM-2 daily or point check, DM-3 weekly inspection work order and DM-4 intermediate or semi-monthly work order. The DM-1 form is illustrated and a separate table shows individual items requiring annual attention.

Red thumb tacks indicate federal inspection dates and call for locomotives to be tied up at the assigned terminal before 6:00 a.m. of the date due. Green tacks indicate

semi-monthly inspections and the work may be done on the date due or one day before or after. Black tacks show weekly inspections. White thumb tacks with the initials of the various inspection points are inserted in the board in place of the colored tacks as soon as word is received that the work has been done. For instance, work called for on locomotive four-unit diesel locomotive No. 567 was done on the fifth of the month at *J*, or Grand Junction as scheduled. Other initials shown on the board include *B* for Burnham (Denver) and *SL* for Salt Lake.

Government inspection requirements are on a time basis and other maintenance is tied to this schedule. Oil changes are made only on laboratory instructions, and at such times locomotive units are held until difficulties are found and corrected. With this procedure, many original cylinder liners and crankshafts are running well in excess of 1,000,000 miles.

The principal point for annual federal inspections and heavy diesel repairs is at the Burnham shops where two units are generally worked on at one time. The effort is to keep a stable force so as to hold experienced diesel mechanics and electricians on this work. Spot, daily and weekly checks of locomotive conditions are made at engine terminals in Denver, Grand Junction and Salt Lake, two passenger locomotives and freight helper diesels being maintained at the latter point. Intermediate inspections are largely handled at Salt Lake.

In general, the endeavor is made to keep all units of a diesel locomotive together during operation, inspection and repairs, but this is not always possible and the flexibility of being able to substitute one unit for another is an important advantage of this type of power. With about 30 diesels to be handled in a 30-day month at each of three points on the D.&R.G.W., the various colored thumb tacks follow quite a uniform pattern at a 45-deg. angle down across the board which means fairly uniform work throughout the month. This result was not achieved at a moment's notice and is still subject to occasional upsets. Experience has shown how to prevent bunching too many similar operations in one shop on the same day.

Another thing carefully watched is not to mix up the locomotive types any more than necessary in any one shop. For example, FT diesels are generally handled in

Form DM-1
12-51

THE DENVER AND RIO GRANDE WESTERN RAILROAD COMPANY

Lead "B" "B" Trailing

ALL UNITS ______

LOCATION ______ DATE ______

SHORT - POINT CHECK - THRU ENGINES - EMD FT-F3-F7-GP7, ALCO 2000-1600 HP

TIME CARD CHARGE CODE		WORK DONE OR CHECKED BY
F	1. Fuel oil supply.	
W	2. Engine cooling water supply.	
S	3. Speed recorder tape marked and tape supply.	
C	4. Cab and windows clean.	
S	5. Cab drinking water and ice supply.	
S	6. Flagging equipment.	
L	7. Engine lubricating oil level and pressure.	
S	8. Sand supply checked.	
M	9. Visual inspection made of running gear - both sides.	
M	10. Air box drains checked for any unusual discharge (EMD).	
M	11. Sander operation checked.	
M	12. Drain main reservoir and auxiliary reservoir.	
M	13. Remove work report and check log book and sign for work done.	

APPROVED ______
Foreman

Explanation of Time Card Charge Code:

Code	Make Charge on Time Card, as Follows:
C	Clean Diesels
F	Fuel Diesels
L	Lubricate Diesels
M	Inspect and Repair Diesels*
S	Supply Diesels
W	Water Diesels

* All items with "M" Code should be charged direct to Diesel Unit Number.

Short form recording inspection of diesel power at intermediate points.

the first 11 days of the month, F3 locomotives the next 10 days and F7 locomotives in the last 10 days. Steam-generator repairs are concentrated in middle of month.

The inspection and maintenance schedule is relatively simple in use, requires little clerical work and can be easily kept up to date. Mimeograph reproductions of the schedule are available for the general office use, master mechanics, dispatchers and enginehouse clerks who telephone necessary information to the general office as required. Log books carried on the lead locomotive units contain a record of information especially helpful to repair men at terminals where the units are maintained.

INDIVIDUAL ITEMS IN ANNUAL INSPECTION WORK ORDER FOR EMD FT, F3, F7 AND GP7 DIESELS—INCLUDES, IN ADDITION, DAILY, MONTHLY, QUARTERLY AND SEMI-ANNUAL WORK

1. Clean and paint all exposed wiring.
2. Clean main generator string band and riser—repaint.
3. Clean and check all magnet valves and air engines.
4. Lubricate reverser bearings and gear rack.
5. Clean and test dynamic brake grids.
6. Check pick up and drop out valves of relays in automatic transition circuits.
7. Check wheel slip and ground relay operation.
8. Flush diesel engine cooling systems.
9. Change out all cooling-system rubber hoses.
10. Apply 10-lb. water test on cooling system.
11. Calibrate speed recorders.
12. Check crankshaft end play.
13. Check main generator, compressor and fan drive alignment.
14. Check alignment of air-compressor gear couplings.
15. Inspect and clean air-compressor valves.
16. Remove and inspect connecting-rod bearings.
17. Magnaflux connecting-rod baskets.
18. Tighten and rewire connecting-rod basket bolts.
19. Check back lash of cam-shaft gear train.
20. Clean oil-separator elements.
21. Check trucks for wear.
22. Inspect lube-oil relief valves for stem shoulders.
23. Remove, clean and test oil-cooler core elements. (This work to be done annually or at engine changeout.)
24. Clean main-reservoir air filters.
25. Hydro and hammer main reservoirs, auxiliary water tanks and radiator spray tanks.
26. Change main-reservoir cut-off valves.
27. 24 RL air-brake equipment (sign for applicable items):
    Change automatic and independent brake valves.
    Change signal reducing valves.
    Change 21-B magnet valves—when used (F3's only).
    Change FA-4 magnet valve.
    Change master controller—when used (F3's only).
28. 8 EL air-brake equipment:
    Dead-engine fixtures when used.
29. Drain oil and flush system. (Note: See chemist.)
30. Lubricate air cylinder on reverser, cam-switch, braking and traction-motor contractors.
31. Lubricate compressor unloader. (All metal type.)

STEAM GENERATOR ONLY

32. Descale water-supply tanks and suction lines.
33. Overhaul water and circulating pump.
34. Overhaul water bypass regulator.
35. Overhaul servo control.
36. Test solenoid and relay coils with megohmmeter.
37. Test ignition transformer with megohmmeter.
38. Hydrostatic test.
39. Repack and test separator blowdown valve.
40. Clean and inspect blower fan bearings.
41. Overhaul motor converter and inspect sealed bearings.
42. Overhaul rotary converter.
43. Inspect and test coil blowdown valve.
44. Inspect coil retainer and pads.
45. Replace fusible metal slug in high-temperature switch.
46. Replace helix in stack switch and test.
47. Overhaul air filter.
48. Overhaul air-reducing valve.
49. Overhaul gear reducer.

Diesel-Electric Locomotive Units In Railway Service

AMERICAN railways added 3,624 diesel-electric locomotive units to their rapidly expanding fleets during 1951. Of these, Class I railroads added 3,463 units and 5,119,150 horsepower to chalk up an expansion of nearly 25 per cent in the number of units and nearly 28 per cent in total horsepower over the inventory of the previous year.

The nation's railways entered 1952 with a total of 18,964 diesel-electric locomotive units. Of these, 17,610 units, representing 23,561,137 horsepower, comprised the power of Class I line-haul railroads and compared with 14,147 units aggregating 18,432,487 horsepower as of December 31, 1950. This increase included 11 units of 2,500 hp.; 20 units of 2,400 hp.; 136 units of 2,250 hp.; 35 units of 2,000 hp.; 687 units of 1,600 hp., and 1,835 units of 1,500 hp.

At the end of 1951 switching and terminal companies and Class II and III railroads owned 1,354 diesel-electric locomotive units with a total of 1,239,290 hp.

Diesel-electric locomotive units in service on Class I line-haul railroads (excluding switching and terminal companies), as of December 31, 1951, were as follows:

Number of Units	Horsepower Each Unit	Total Horsepower
36	3,000	108,000
42	2,400–2,500	103,000
255	2,250	573,750
1,310	1,800–2,000	2,613,400
965	1,600	1,544,000
7,469	1,500	11,203,500
1,173	1,350	1,583,550
6,360	1,200 or less	5,831,937
Total 16,610		23,561,137

A similar tabulation was published in the May 14, 1951, *Railway Age* and the May 1951 *Railway Mechanical and Electrical Engineer* for 1950.

DIESEL-ELECTRIC LOCOMOTIVE UNITS IN SERVICE ON CLASS I RAILROADS

Excluding Switching & Terminal Companies—As of December 31, 1951

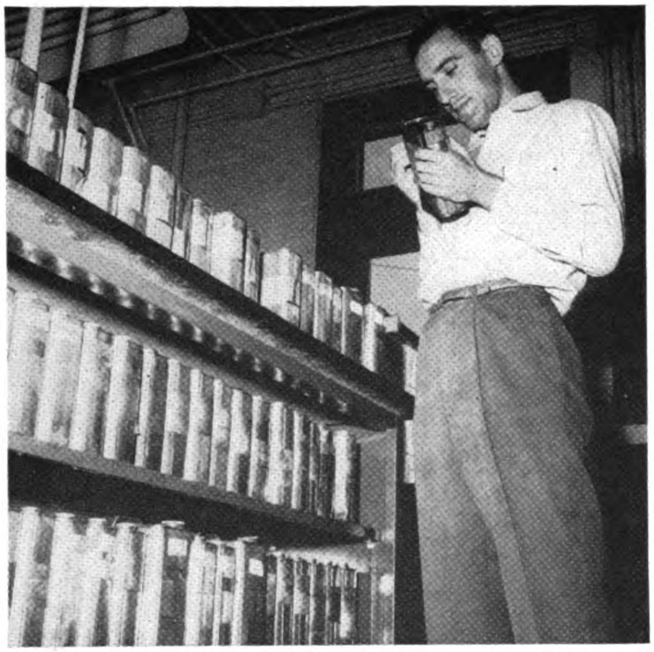
Railroad	Number of Units in Various Horsepower Classes*								Total	
	3000	2400 or 2500	2250	1800 or 2000	1600	1500	1350	1200 or less	Units	Horsepower†
Akron, Canton & Youngstown	....	....	....	5	3	1	....	2	11	18,300
Ann Arbor	....	....	....	....	14	....	....	9	23	28,720
Atlanta & St. Andrews Bay	....	....	....	....	....	1	....	12	13	13,500
Atlanta & West Point—W. of Ala	....	....	....	....	....	14	....	7	21	28,200
Atlantic & Danville	....	....	....	....	1	6	....	....	7	10,600
Atchison, Topeka & Sante Fe	....	....	....	66	19	511	320	256	1,172	1,605,530
Atlantic Coast Line	....	....	5	59	....	302	72	107	545	801,050
Baltimore & Ohio	....	....	8	44	10	272	24	239	597	793,660
Bangor & Aroostook	....	....	....	2	....	32	....	4	38	56,000
Bessemer & Lake Erie	....	....	....	....	....	31	....	2	33	48,030
Boston & Maine	....	....	1	21	....	34	68	71	195	239,550
Cambria & Indiana	....	....	....	....	....	....	....	2	2	2,400
Central of Georgia	....	....	2	10	....	41	....	25	78	107,980
Central of N. J.-Cent. of Pa	....	....	....	6	16	44	....	60	126	160,060
Central Vermont	....	....	....	....	....	....	....	4	4	4,000
Charleston & W. Carolina	....	....	....	....	....	27	....	2	29	42,900
Chesapeake & Ohio, incl. P. M	....	....	22	12	26	151	....	179	390	529,180
Chicago & Eastern Illinois	....	....	....	3	....	66	....	24	93	124,400
C. & N. W.—C. St. P. M. & O	....	....	8	40	17	194	8	188	455	584,170
Chicago, Burlington & Quincy	....	....	22	58	....	163	74	173	490	672,800
Chicago Great Western	....	....	....	9	....	84	....	41	134	180,235
Chicago, Indianapolis & Louisville	....	....	....	....	....	47	....	10	57	79,700
Chicago, Milwaukee, St. P. & Pac	....	....	....	35	22	173	52	208	490	636,460
Chicago, Rock Island & Pacific	....	....	7	31	35	139	48	153	413	517,560
Clinchfield	....	....	....	....	....	38	....	6	44	64,200
Colorado & Southern	....	....	....	2	....	12	....	5	19	27,200
Colorado & Wyoming	....	....	....	....	....	4	....	3	7	9,000
Columbus & Greenville	....	....	....	....	....	6	....	2	8	10,132
Delaware & Hudson	....	....	....	....	....	53	....	50	103	12,9500
Delaware, Lackawanna & Western	....	....	10	....	....	71	20	61	162	202,840
Denver & Rio Grande Western	....	....	....	6	5	79	48	37	175	234,760
Detroit & Mackinac	....	....	....	....	....	6	....	1	7	9,660
Detroit & Toledo Shore Line	....	....	....	....	....	4	....	4	8	10,880
Detroit, Toledo & Ironton	....	....	....	....	....	5	....	14	19	21,700
Duluth, So. Shore & Atlantic	....	....	....	4	....	9	....	8	21	29,500

* Number of Units Based on A. A. R. Statistics. † Horsepower Compiled by the Simmons-Boardman Publishing Corporation.

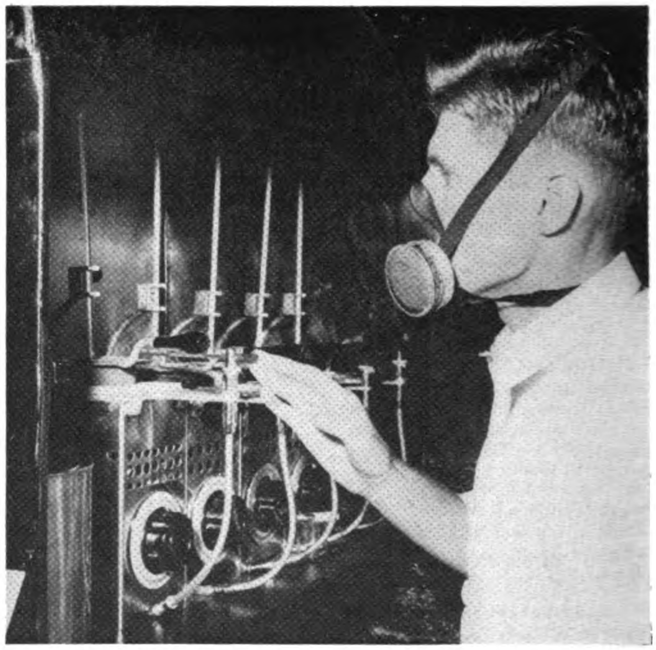
DIESEL-ELECTRIC LOCOMOTIVE UNITS IN SERVICE ON CLASS I RAILROADS—CONTINUED

Railroad	Number of Units in Various Horsepower Classes								Total	
	3000	2400 or 2500	2250	1800 or 2000	1600	1500	1350	1200 or less	Units	Horsepower
Elgin, Joliet & Eastern	....	....	....	36	....	14	....	111	161	187,900
Erie	....	....	16	12	58	165	24	129	404	552,780
Florida East Coast	....	....	....	26	....	23	....	....	49	86,500
Ft. Worth & Denver	....	....	2	2	....	12	....	5	21	31,100
Georgia & Florida	....	....	....	....	....	6	....	3	9	10,800
Georgia	....	....	....	....	....	13	....	10	23	29,900
Grand Trunk Western	....	....	....	....	....	22	....	36	58	67,700
Great Northern	....	....	....	13	....	239	96	118	466	631,500
Green Bay & Western	....	....	....	....	....	11	....	4	15	19,420
Gulf Coast Lines	....	....	....	2	....	52	....	19	73	99,650
Gulf, Mobile & Ohio	....	....	....	17	8	153	....	68	246	344,540
Illinois Central	....	....	8	22	....	2	4	137	173	214,980
Illinois Terminal	....	....	....	....	....	....	....	19	19	19,000
International-Great Northern	....	....	2	4	....	43	....	11	60	85,260
Kansas City Southern	....	....	....	11	....	47	....	35	93	129,160
Lake Superior & Ishpeming	....	....	....	....	2	3	....	1	6	8,700
Lehigh & Hudson River	....	....	....	....	13	....	....	....	13	20,800
Lehigh & New England	....	....	....	....	....	26	....	7	33	45,440
Lehigh Valley	....	....	....	14	10	66	8	126	224	271,260
Long Island	....	4	....	8	8	1	....	45	66	77,440
Louisiana & Arkansas	....	....	....	3	....	39	....	22	64	88,500
Louisville & Nashville	....	....	4	28	10	136	....	137	315	409,220
Maine Central	....	....	....	7	....	25	....	27	59	71,560
Midland Valley-K. O. & G.-O. C.-A.-A.	....	....	....	....	....	6	....	1	7	10,000
Minneapolis & St. Louis	....	....	....	....	....	16	9	46	71	78,950
Minneapolis, St. P. & S. Ste. Marie	....	....	....	....	....	96	....	18	114	160,980
Missouri-Illinois	....	....	....	....	....	1	....	3	4	5,700
Missouri-Kansas-Texas	....	....	19	6	29	91	....	28	173	265,650
Missouri Pacific	....	....	12	22	33	177	24	143	411	568,800
Nashville, Chatt. & St. Louis	....	....	....	....	....	86	....	43	129	170,420
New York Central System	....	....	18	103	213	343	10	550	1,237	1,548,160
New York, Chicago & St. Louis	....	....	....	11	....	13	....	93	117	135,140
New York, New Haven & Hartford	....	2	....	87	45	62	....	159	355	459,420
New York, Ontario & Western	....	....	....	....	....	7	18	22	47	56,180
New York, Susquehanna & Western	....	....	....	....	....	....	....	22	22	20,380
Norfolk Southern	....	....	....	....	5	10	....	8	23	28,780
Northern Pacific	....	....	....	....	....	135	44	68	247	328,740
Northwestern Pacific	....	....	....	....	2	13	....	9	24	27,460
Pennsylvania	22	36	28	213	169	376	....	701	1,545	2,072,790
Pennsylvania-Reading Seashore Lines	....	....	....	....	....	6	....	1	7	9,800
Pittsburgh & Lake Erie	....	....	....	4	....	10	....	47	61	72,000
Pittsburgh & West Virginia	....	....	....	10	1	....	....	1	12	22,600
Reading	....	....	....	....	50	54	20	117	241	292,560
Richmond, Fredericksburg & Potomac	....	....	10	....	....	25	....	22	57	82,000
Rutland	....	....	....	....	5	....	....	7	12	14,600
St. Louis-San Francisco	....	....	17	6	....	242	....	103	368	512,150
St. Louis Southwestern	....	....	....	3	8	33	20	36	100	132,100
Sacramento Northern	....	....	....	....	....	....	....	6	6	2,280
Seaboard Air Line	14	....	6	54	72	144	44	65	399	618,020
Southern Pacific (Pacific)	....	....	1	42	7	526	....	199	775	1,071,630
Southern System	....	....	7	35	32	399	70	176	719	1,001,950
Spokane International	....	....	....	....	....	....	....	9	9	9,000
Spokane, Portland & Seattle	....	....	....	1	2	44	....	28	75	99,120
Staten Island Rapid Transit	....	....	....	....	....	....	....	8	8	6,800
Tennessee Central	....	....	....	....	4	6	....	5	15	19,720
Texas & New Orleans	....	....	....	12	....	100	....	77	189	250,260
Texas & Pacific	....	....	8	10	....	134	....	32	184	273,400
Texas Mexican	....	....	....	....	....	5	....	13	18	16,820
Toledo, Peoria & Western	....	....	....	....	....	10	....	3	13	18,000
Union (Pittsburgh)	....	....	....	....	3	24	....	107	134	136,950
Union Pacific	....	....	....	65	....	329	....	207	601	837,080
Wabash	....	....	12	8	....	130	....	84	234	315,620
Western Maryland	....	....	....	....	8	35	....	24	67	86,360
Western Pacific	....	....	....	....	....	63	48	30	141	185,380
Total	36	††42	255	**1,310	965	7,469	1,173	6,360	17,610	23,561,137

** Includes 33 1800 horsepower units. †† Includes 22 2500 horsepower units.
Note: Since the number of diesel-electric locomotive units in the above tabulation were based on A. A. R. statistics, only those units, received by the railroads from the builders, that were reported to the A. A. R. as installed in 1951, were included.

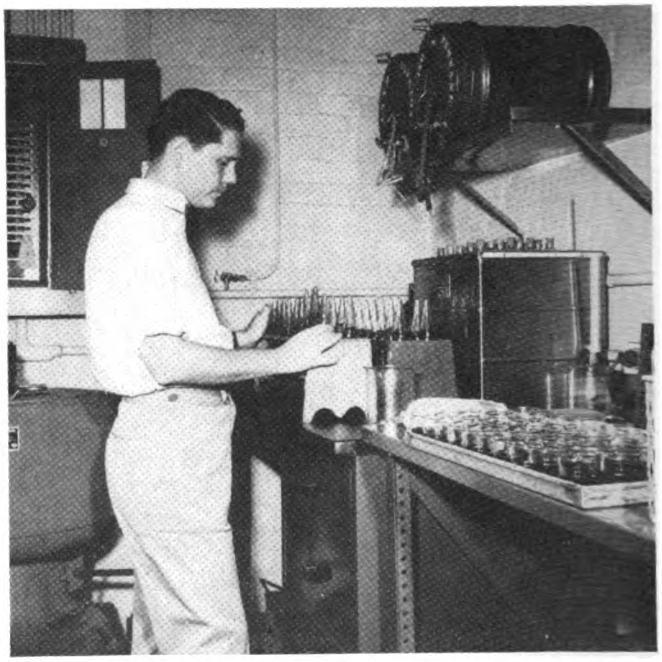


A laboratory number is assigned to each incoming sample of lubricating oil.



Another indicator of dilution is the flash-point test.

Laboratory Control of Diesel Maintenance



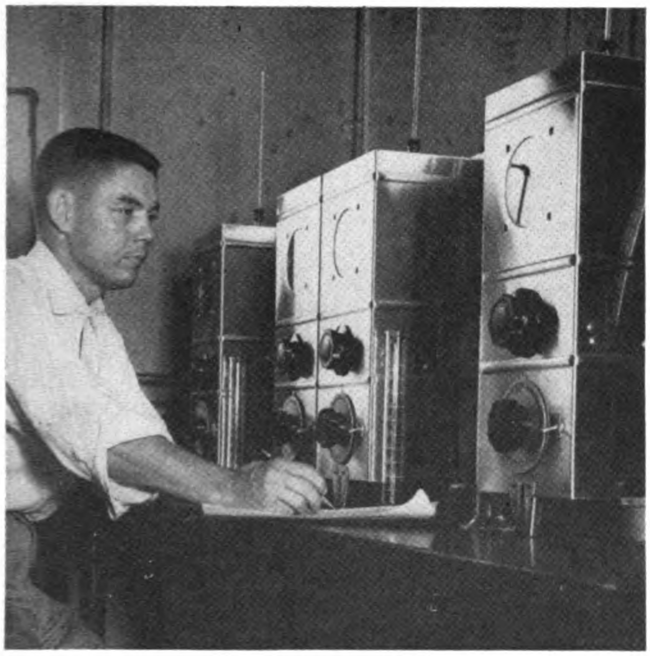
Two tests are made for insoluble matter, one to determine the amount of dirt present; the second to learn the presence of sludge, gum, varnish and other oxidized materials.

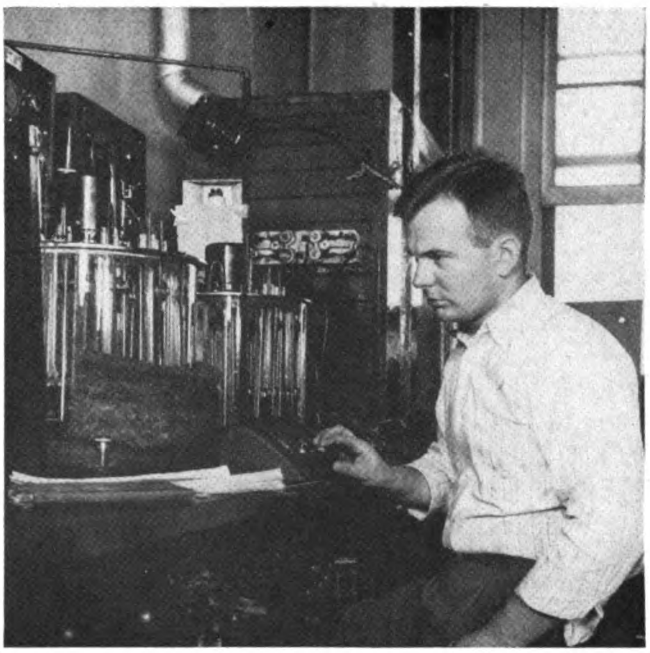
Diesel maintenance cost reduced substantially by lube oil testing program and other test department measures

A PROGRAM of periodic lubricating oil sample checking by the Southern's test department, one of several functions performed by the laboratory to keep diesel locomotive operating and maintenance costs to a minimum, locates many engine troubles before they become serious enough to require costly repairs.

Lube oil samples are taken after each 5,000 miles in freight service, each 10,000 miles in passenger service, at each monthly inspection for switching locomotives, and whenever the oil is changed for any reason. The average cost is $5.45 per sample in each of the foregoing instances; spectrographic analyses run on the same schedule are done at the Industrial Research Institute of the University of Chattanooga at a cost of $7.50 each.

During an initial 13-month period using the spectrographic analysis in addition to the regular lube oil tests, on 30 locomotives for the first three months and 50 thereafter, three crankshafts and one gear train were definitely saved by the spectrograph. The spectrograph was responsible for locating failures of such small parts as wrist pin bushings, which, while not expensive in themselves, could





Other diesel test work includes stack-gas analyses, investigation of cleaning compounds, and the oil distillation test (left). Running a viscosity test on a lube-oil sample to check for dilution and oxidation (right).

or a large number of red squares are found at frequent intervals for the locomotive, an investigation is begun immediately.

A Typical Case History

The value of the two types of lube oil tests is well-illustrated by the case history of a 1,500-hp. diesel A-unit having a 12:65 gear ratio. It was bought in December 1944 and used in mountain freight service:

Jan. 1945—First lube oil sample taken.

June 1946—Sample showed oil oxidizing, which would cause corrosion, due to acidity, and thickening, which would deposit gum on moving parts. Oil ordered changed. Engine examined, and oil cooler core found plugged. This was corrected, the oil and the filter changed.

Sept. 1946—Oil badly diluted. Master mechanic was wired to change oil and look for fuel leakage. Leaky injector found.

Aug. 1947—Dirt in oil. Oil and body filters changed ahead of time and filter system checked and cleaned.

May 1948—Oil again dirty, above procedure repeated. Water also found in the oil, caused by a leak around core of oil cooler.

June 1948—Oil again dirty, usual procedure repeated.

Sept. 1948—Oil diluted, caused by the P-pipes to two injectors leaking.

Dec. 1948—Water in the oil. Master mechanic wired to change the oil, inspect main bearings and look for leaks. Bearings o.k., but liner seals leaked.

Feb. 1949—Oil badly diluted, caused by a hole in the crown of the piston.

Feb. 1949—This unit was selected as one of 50 test locomotives for monthly spectographic analysis to determine presence of any residual metals in lube oil ash.

July 1949—The sample test showed oil to be satisfactory, but the spectrographic analysis indicated high residual metallic content of tin, copper, lead and iron. Locomotive ordered removed from service immediately by telephone for inspection. The bearings had wiped and the crankshaft was riding on the backs of the bearings and was on the verge of seizing. Engine overhauled and returned to service. Crankshaft failure prevented.

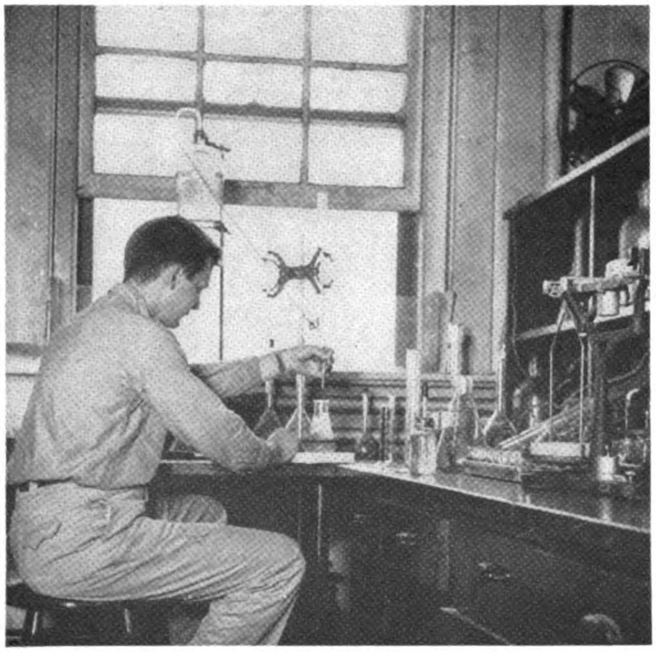
SPECTROGRAPHIC ANALYSIS RESULTS ON A DIESEL UNIT FOR 4 MONTHS SHOWING THE BUILD-UP OF METALS CONTENTS IN THE ASH IN PARTS PER MILLION FOR THE MONTH OF JULY WHEN THE RESULTS PREVENTED A CRANKSHAFT FAILURE

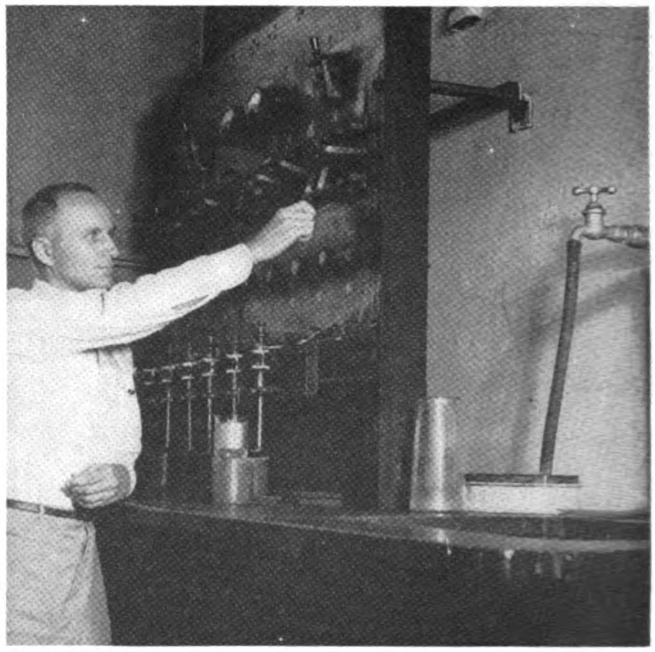
	June	July	Sept.	Oct.
Mileage	1,552	11,292	2,844	8,624
Gallons added	0	45	......	......
Ash	.25	.28	.30	......
Fe	72.00	1310.00	105.00	238.00
Cu	8.00	50.00	10.30	16.20
Pb	2.45	10.10	2.30	14.00
Sn	.55	15.00	.70	1.75
Ag	.45	1.50	.55	.85
Al	.60	3.82	......	......
Ca	225.00	445.00	140.00	198.00
Ba	......	......	400.00	64.50
Sr	......	......	......	47.50
Na	......	......	......	Present
P	235.00	......	183.50	178.50
Zn	......	2.00	......	......
Mn	.65	3.60	.85	3.10
Ni	.26	2.15	......	......
Mg	.40	2.80	.10	.45
Cr	......	4.30	......	......
Mo	......	......	......	Present
Si	......	......	......	......

Another important diesel maintenance function performed by the test department is the investigation of cleaning materials and the development of cleaning methods for diesel power. Seven principal projects are currently being investigated and put into practice in the major divisions of diesel cleaning.

Ten different detergent cleaners were evaluated for cleaning parts and assemblies in hot baths to remove oil, varnish and carbon deposits. The result of this development was the standardization on a cleaner which sold for a much lower price than the one formerly used and did a better job.

A cleaner chemist visits all shops, prepares standard methods adopted to that shop's requirements, and in-





Left: Testing a lube-oil sample for acidity. Right: Miscellaneous work includes analyzing the composition of metals, such as the determination of the copper content of the brass sample above.

cause serious contingent damage, in this case a wrecked cylinder or worse.

Perhaps the best proof of the potential value of the spectrograph lies in a crankshaft which did fail. On this occasion the analysis showed a dangerous buildup of metal content in the oil, but due to a 25-day delay in obtaining the results during the initial test period in the use of the spectrograph, the crankshaft failed before the results of the analysis were known.

The periodic samples taken from all diesel locomotives are tested for four principal things: viscosity, flash point, and two types of insoluble matter. The test for the first type of insoluble matter shows the amount of dirt present in the sample; the second detects the presence of sludge, gum, varnish and other oxidized materials.

An average of three or four analyses out of each 24 show some trouble in the oil, and consequently in the engine. The analyses also indicate by the viscosity and viscosity index tests whether different brands of oil have been mixed by mistake.

Examples of engine troubles indicated by the oil tests are leaky seals, shown by water in the oil; inoperative by-pass valves, shown by dirt in the oil and found by a high precipitation number; leaky injectors, causing fuel oil dilution and shown by a reduction in viscosity; and exhausted additive, which results in an increase in oxidation.

Detail work in taking the sample is reduced to a minimum. The only equipment required is a standard one-quart screw-top can and a single form, TD-9. The top half of this form has 14 blanks to be filled in at the service point where the sample is taken, giving such information as the sample serial number, the locomotive number, brand and S.A.E. number of the oil, date the sample was taken, date previous oil change, mileage or hours and make-up oil added since previous oil change, whether oil or oil filters were changed when sample was taken and reason for change, types of filters and mileage since last change, any comments, and the person submitting the sample.

The lower half of the form is divided into two parts by a vertical line down the center. The right half contains instructions for taking the sample while the left half is reserved for the chemist to fill in information on the technical properties of the oil, such as flash point, viscosity, neutralization number, water, etc.

The service point fills out TD-9 and sends it to Alexandria, Va., if on the eastern lines, or to Chattanooga, Tenn., if on the central or western lines. The service point fills in the top half of the sheet. The test department then fills in the lower left portion of TD-9, and later transcribes this data to a second form, TD-10. Copies of this form are sent to the master mechanic, the general diesel supervisor, the superintendent of motive power, the diesel superintendent, representatives of the oil company, and the locomotive manufacturer's regional service representative. One copy is kept on file at the laboratory.

If the locomotive is transferred from one region to another, the records are also transferred with the locomotive from one laboratory to the other. If the locomotive is serviced at two or more points, or if the master mechanic and the general foreman of the service point are at different locations, both receive a copy of TD-10.

If difficulty is found with the oil, the master mechanic is required to furnish a report to the diesel superintendent, with copies to the oil laboratory and to the superintendent of motive power, advising what was found and how the difficulty was corrected. Where anything is found wrong with the oil, the master mechanic is notified immediately by telephone or telegraph. An entry of such a call or wire is made on TD-10. For example, if water is found in the oil, the master mechanic is immediately telephoned or telegraphed to change the oil and search for water leaks.

The diesel superintendent has a board of all locomotives. Check marks are entered after a locomotive when an oil sample is sent in. The square is colored red when something is found wrong with the oil. If three such red-colored squares appear in a row for any one locomotive structs personnel. He determines the contents of each cleaning tank, the proper cleaning charge to be added, the

amount of make-up cleaning material to be added each day, the life of the cleaning material before draining and the frequency and amount of recharging. All this information is stencilled on the cleaning tank. At the present time two principal types of hot bath cleaning are employed, one for steel, cast iron, brass and galvanized parts, the second for aluminum parts.

For cleaning interior painted surfaces on the engine and the locomotive cab, eight materials were tested. The test department standardized on one and developed proper equipment and methods for cleaning, such as where to use brushes, where sponges, etc.

Two ways were developed for cleaning and oiling car body filters, hot vats and automatic cleaning machines. Four materials were tested and one standardized on. The test department is currently working on the development of an improved type of oil for dipping.

For cleaning diesel locomotive exteriors six types of materials were investigated; methods, concentration and equipment to use were developed for each.

For cleaning the locomotive running gear, it was learned that an alkali cleaner was required to remove the combination of oil and dirt which had to be emulsified, while an acid-type cleaner was required to dissolve the deposit of rust from the brake shoes and red clay. The department developed a system of spraying with acid-type cleaner and washing off with an alkaline type. The spraying nozzles used for this work were also developed by the test department.

To clean and spray top decks and air box passages, three types of solvents were experimented with. Spraying equipment was developed which not only does a better cleaning job but reduces the fire hazard and the toxicity to the operator.

Materials and methods for cleaning electrical equipment are currently under investigation.

By means of the above technique expenditures for cleaning have remained about constant despite annual increases in the use of diesel power.

Various types of corrosion inhibitors were also tested, and an alkaline-sodium-chromate treatment standardized upon. The concentration is controlled by calibrated conductivity meters installed in each shop, serviced and maintained by the system water chemist. Water on the locomotives is tested each time the locomotive is in the house; the conductivity meters are tested every six months.

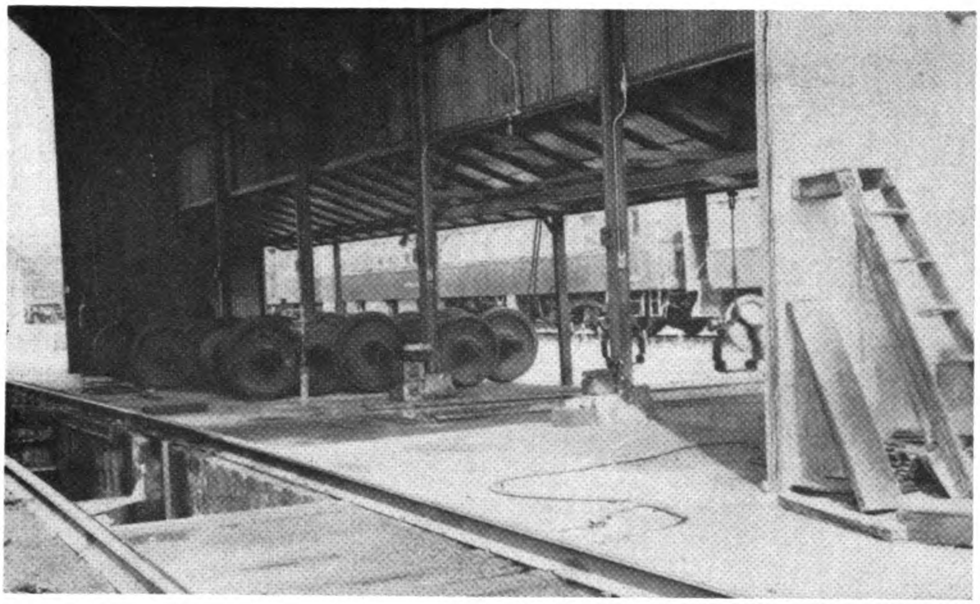
Despite the fact that large quantities of the inhibitor is used, the product is purchased in 20-oz. packages, which is the amount required for each 50 gallon of cooling water. While the cost per unit of the inhibitor is considerably increased by using 20-oz. packages rather than purchasing it in the bulk, it was felt that the use of small packages would be cheaper in the long run. Greater accuracy is attained, and waste is considerably reduced because people handling things that come in small packages tend to be more careful in avoiding spillage than with things which come in bulk.

The test department also conducted extensive experiments with the use of anti-freeze on 25 switching and road switching locomotives which lay over 8 to 16 hours between working shifts. Two principal problems were encountered. One was the selection of an anti-freeze which had a sufficiently high boiling point, particularly for withstanding local overheating, without decomposing. A second was to prevent corrosion as the alkaline-sodium-chromate corrosion inhibitor was not compatable with the rust inhibitor in commercial anti-freezes. An ethylene-glycol-type anti-freeze was selected after assurance by the manufacturer that the organic corrosion inhibitor would be satisfactory.

Weekly samples were taken from each of the 25 test locomotives to test the effective corrosion inhibitor left by measuring the reserve alkalinity; to test for iron content in solution or suspension which would indicate corrosion of various parts; and to test the freezing point of the solution as a measure of weather leakage of the anti-freeze.

The cylinder liner assemblies in the engine crankcases were visually inspected monthly to see if any corrosion were occurring. All 25 locomotives went through an entire season without corrosion difficulties, indicating that diesel locomotives can be protected by anti-freeze.

This picture, taken April 21, 1952, in the Union Pacific's Omaha, Neb. machine shop, shows some of the preparations for the approach of flood waters. Past experience indicated that the elevation and removal of machine tools was a necessity in order to protect electrical equipment and other vital parts of the machines. Here several of the machine tools are raised to a point where they would not be affected by flood waters if they came. Fortunately, they did not.

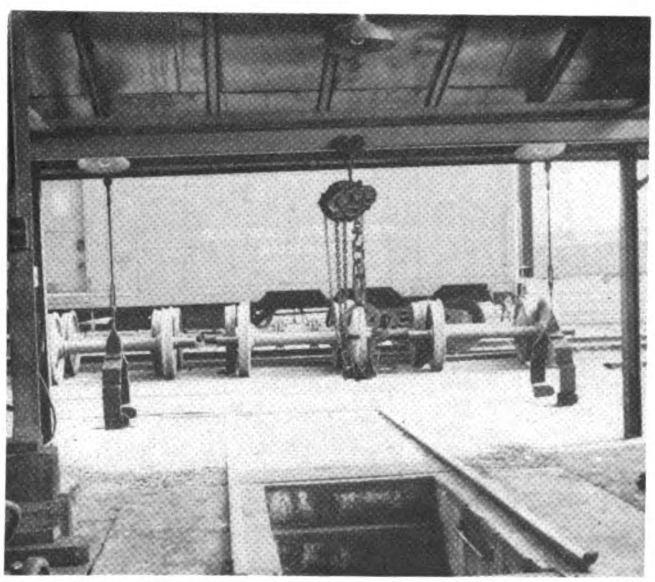


The passenger-car-truck building. The drop pit is in the left foreground, the wheel storage area in the center background, and the box holders at the right.

Passenger Truck Work at Grand Rapids

Several interesting working arrangements and procedures have been incorporated into a building for handling Chesapeake & Ohio passenger car truck work on the Pere Marquette District at Grand Rapids, Mich.

The building is of corrugated steel 50 ft. long by 25 ft. wide enclosed along one side and both ends with the exception of the two entrance ways. The second side, which faces the coach yards, is open. A single through track extends along the enclosed wall with the center of the track 10 ft. from this wall, and the area between this track and the open side of the building is concreted. A winch is installed on the stub end of this track outside the shop for moving cars, and the building is well illuminated by overhead lights.



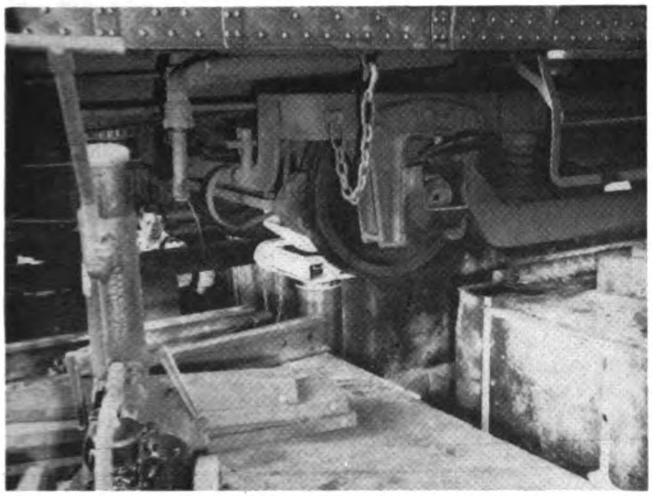
The center hoist on the near monorail handles the boxes between the floor and the two box holders which hang from the rear monorail. It also handles Hyatt and solid bearing boxes on and off the wheel set.

The through track has a drop pit located near the end of the building from which the general view in one of the illustrations was taken; this will be referred to as the working end of the building, as contrasted with the other, or wheel storage end. The pit is 22 ft. long and $3\frac{1}{2}$ ft. deep, and it is equipped with a 30-ton electric jack for handling a single pair of wheels.

The outlet track for the drop pit is 18 ft. from the working end of the building and in the center of the 22-ft. pit. The outlet track pit is 12 ft. long. Standard gage rails are laid at floor level along the top of this pit beginning 6 ft. from the nearest rail of the through track and extending to the near track of the coach yard. This track is used for solid and roller bearing box changeout. It is convenient to the drop pit for wheels removed from cars on the through track, and to the storage area for mounted wheel sets immediately behind this track in the general view.

Two operations performed in the building are of particular interest because of the special equipment designed by the shop forces for performing them efficiently. First is the equipment for changing solid bearing and Hyatt roller bearing boxes. This comprises two monorails, one near the open side of the building, and the second 3 ft. inside of the first.

The first monorail is 12 ft. long, and from it is suspended two box holders mounted on rollers for travel



An old style car truck on the drop pit.

back and forth along the rail. The small vertical adjustments in height necessary to level the holders up with boxes mounted on different sized wheel sets are made by turnbuckles. These holders are not used to raise the box from the floor nor to lower it to the floor. They merely slip around the boxes and carry them at constant height clear of the journals of the wheel set.

Raising and lowering the boxes is done by a second box holder which hangs from the inside monorail. This holder operates on a tong principle and removes and replaces the box from the journal to the floor area when boxes are changed.

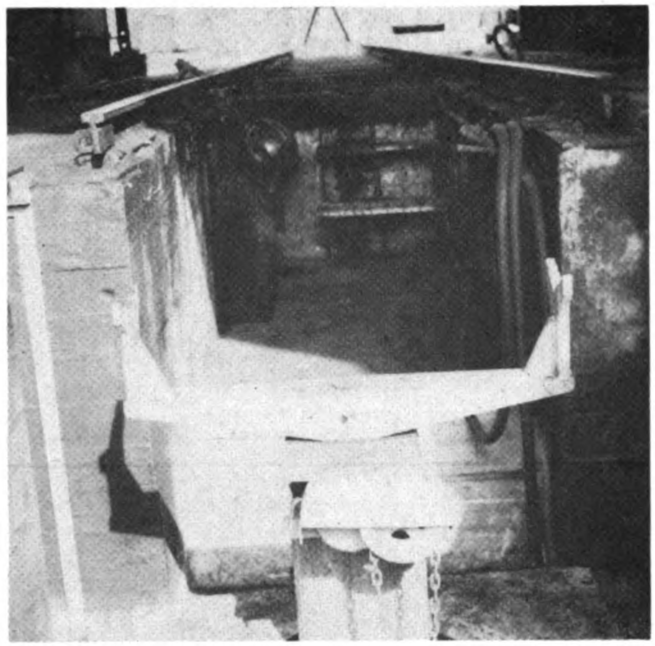
The second set of special equipment used in this building is for leveling new and old style cars and changing bolster springs on new style cars. It is used in the drop pit in conjunction with the 30-ton pit jack, and consists of fittings for this jack for the different operations.

The jack crossbar is 41 in. long and therefore wide enough to fit around generator gear drives. It is 39 in. between the insides of the uprights, 5 in. wide, 4 in. deep at the center and 1½ in. deep at the ends. The uprights are 1 in. thick. The height from the crossbar to the top of the Y is 11 in., to the bottom of the notch of the Y is 9 in. The crossbar joins to the jack shaft through a 2½-in. pin.

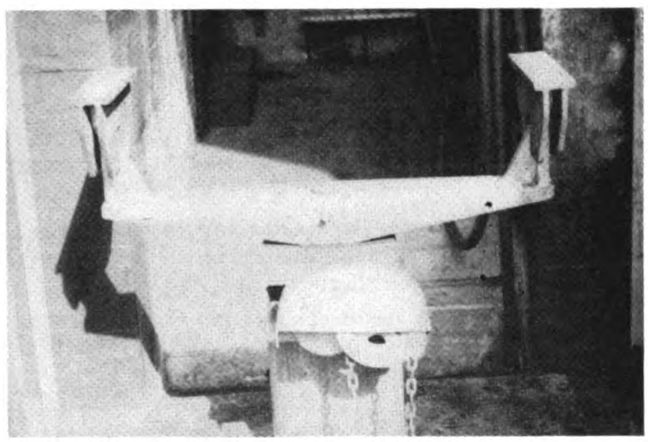
The first set of fittings used with this jack are a pair of shoes to level or to adjust the height of old style cars by shimming under the spring plank. This is done by taking the weight off the coil springs after compressing the elliptic springs. The shoes for this job are made from sections of ½-in. plate welded together, have a length of 14 in. and a height of 8 in. The base is 3½ in. wide and has affixed to it a triangular section to mate with the vee of the Y.

For truck work on new style cars with all coil springs, a cradle is placed on top of the jack shoes. Two 50-ton air jacks raise the car body with the bolster. The cradle lowers and raises the spring arrangement for shimming or changing the bolster coil springs.

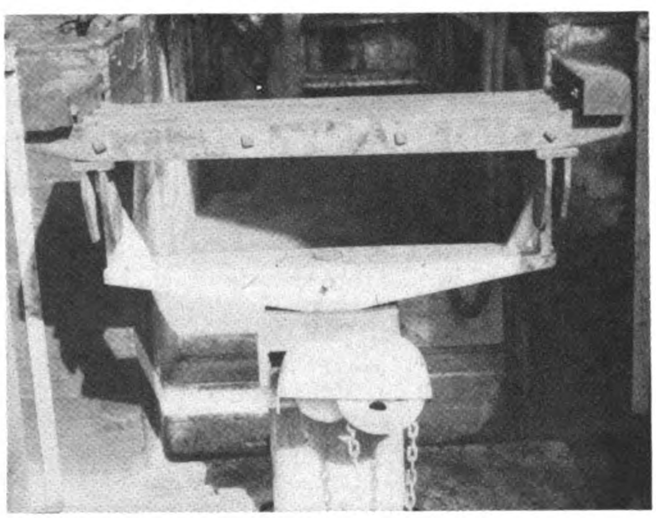
The cradle is 51 in. by 12 in. by 3 in. with an offset of 1 in. on each end as shown in one of the illustrations. It is built up from three lengths of 3 in. by 3 in. wood and four lengths of strap iron ⅝ in. by 3 in. all bolted together. The strap iron sections fit between the wooden sections and on each end. A 2⅜-in. hole is bored through the center wood to accommodate the center pin. The end blocks are 15 in. long, 3 in. high and 4 in. wide, and are on 46-in. centers.



The drop pit jack is fitted with a crossbar wide enough to fit around generator gear drive units.



The shoes in place on the jack for leveling or adjusting the height of old style trucks.



The cradle fits on top of the shoes for shimming or changing bolster coil springs.

QUESTIONS AND ANSWERS

Diesel-Electric Locomotives*

Lubricating Oil Cooler

471-Q.—What does each unit consist of- A.—Each unit consists of a bundle of tubes rolled into tube sheets, which in turn are welded to the shell.

472-Q.—Can the tube bundle be removed from the shell? A.—No.

473-Q.—What kind of material is used in the construction of the cooler? A.—The tubes are constructed of seamless Admiralty metal, the shell and tube sheets of steel, and the end covers of cast aluminum.

474-Q.—How does the cooling water flow through the cooler? A.—Cooling water from the radiators flows into the top end cover of the unit, down through the tubes and out at the bottom.

475-Q.—How does the oil flow through the cooler? A.—The hot lubricating oil enters at the bottom of the shell, circulates back and forth across the tubes and leaves the cooler at the top.

476-Q.—What happens during this process? A.—Heat is removed from the oil due to its contact with the tubes through which the cooler water is flowing.

477-Q.—What provision is made to channel the flow of oil in the most efficient manner? A.—Baffles are provided inside the shell for this purpose.

478-Q.—What should be done after the system is filled with oil? A.—The shell, which contains the oil, should be vented to release any air that may have been trapped therein.

479-Q.—How can the shell be vented? A.—By removing the pipe plug provided in the top shell flange. After replacing the plug the unit is ready for operation.

Cleaning Cooler Tubes

480-Q.—When cleaning inside tubes (water side), how can access be obtained? A.—Access to the water side of the tubes can be obtained by unbolting the end flanges and removing the end covers.

481-Q.—How is the scale removed? A.—Soft scale may be removed by means of brushes. Should hard scale be present, tube cleaners may be used. Observe care in handling tubes as they are of a very thin wall.

482-Q.—How is the outside or oil side of the tubes cleaned? A.—The oil side of the tubes may be cleaned by steaming out or by circulating a cleaning fluid through the pipe connections provided at each end of the shell.

483-Q.—Before cleaning is started, what must be done? A.—It is necessary to drain the oil from the pipe tap in the bottom shell flange, and to blank off oil inlet and outlet lines.

484-Q.—How often should the oil side of the cooler tubes be cleaned? A.—Experience indicates that the oil side of the tubes should be cleaned yearly.

485-Q.—Is it necessary to remove the cooler from the locomotive for cleaning? A.—Cleaning can be done quickly without removing the cooler from locomotive by using 100 gallons of cleaning solution, heated and passed by steam through the oil side.

486-Q.—What should be the first operation? A.—Isolate the oil side by blanking off the inlet and discharge flanges and connect a steam aspirator for cleaning. Steam hose lines should be sufficiently long for cleaning the coolers in place. A Turco Steam unit or any similar aspirator unit is satisfactory.

487-Q.—How is the cleaning solution prepared? A.—By mixing 100 gallons of water with 4 lbs. of Turco "Steam Off" or 8 lbs. of Oakite "92."

488-Q.—What should be done to protect the engine cooling system? A.—Drain the engine cooling system as steam pockets will form during the cleaning process.

489-Q.—What other precautions must be taken? A.—During the operation avoid contact with the steam lines and fittings extending into the locomotive due to their high temperature.

490-Q.—What should be done further? A.—Fill the cooler with cleaning solution by closing the discharge valve from the cooler, opening the vent valve and opening the steam supply valve gradually.

491-Q.—What is necessary in order to clean the full length of the tubes? A.—It is necessary to first fill the cooler with the solution and to keep the cooler full during the cleaning process.

492-Q.—What is done after the solution has passed through the cooler once? A.—It is then discharged as waste.

493-Q.—What pressure should be maintained in the cooler during the cleaning process? A.—Pressure in the cooler should be maintained as near 50 lbs. p.s.i. as possible and should not exceed 75 lbs.

494-Q.—What should the rate of flow be held to? A.—Two gallon per minute approximately, or about one hour to pass all the solution through, and the cooler kept full during the operation.

495-Q.—Why should the vent line be kept open? A.—Material flowing from the vent line shows the cooler to be full.

496-Q.—What must be done to get the proper quantity of solution to flow with the steam? A.—The valves on the aspirator must be so regulated.

497-Q.—After cleaning, what must be done? A.—After cleaning, flush cooler with water by filling solution tank and passing the water through the cooler with the steam aspirator. A faster flow may be used than with the solution.

* This series of questions and answers relate specifically to the Alco-G.E. Diesel electric locomotives.

498-Q.—After flushing, what is required? A. — Thoroughly drain after flushing, opening the ¼" pipe tap in the lower shell flange.

499-Q.—Should the cooler be dried? A. — Yes. Pass steam through the cooler to thoroughly dry it.

500-Q.—After the cooler is dry, what should be done? A.—Return all connections to original status, removing flange blanks and replacing drain and vent plugs.

501-Q.—What inspection should then be made? A.—Inspect tube surfaces to make sure they are clean. They will not necessarily be bright but should be free of deposits.

502-Q.—Will the cleaning operation just described suffice for excessively dirty coolers, due to oil of improper characteristics or too long a period between cleaning? A.—No. They should be removed for vat cleaning.

503-Q.—If lubricating oil should appear in the sight glass of the expansion tank, what is it a sign of? A. — A tube failure.

504-Q.—What are the indications if water shows up in the lubricating oil? A.—The same thing—a tube failure.

Schedule 24 RL

Air Brakes

Master Controller and 21-B-Magnets and Bracket

1334-Q.—What action should be taken if control pipe 11 to the master controller is broken?
A.—It must be repaired to have an electro-pneumatic brake.

1335-Q.—What else can be done?
A.—Move brake valve shifter lever to *AU* position and proceed with the automatic brake.

1336-Q.—What should be done if the straight air pipe 4 is broken?
A.—It must be repaired to have an electro-pneumatic brake. Otherwise move brake valve shifter lever to *AU* position and proceed with the use of the automatic brake.

1337-Q.—What should be done if auxiliary reservoir pipe 6 is broken?
A.—It must be repaired to have an electro-pneumatic brake.

1338-Q.—Is the automatic brake operative?
A.—To have an automatic brake, the auxiliary reservoir leak must be stopped.

1339-Q.—What other course can be taken?
A.—The automatic brake can be cut out by closing brake pipe branch cut-out cock and use the independent brake valve.

D-24 Control Valve

1340-Q.—If any of the following: Displacement reservoir pipe 3, auxiliary reservoir pipe 5, or emergency reservoir pipe 2 are broken, what must be done?
A.—In case of breakage of any of these pipes close the brake pipe branch pipe cut-out cock. The automatic locomotive brake is inoperative but the independent brake can be used.

1341-Q.—What must be done if main reservoir pipe 6 is broken?
A.—Stop the leak by a close tight bend in the pipe.

1342-Q.—What operation is thus affected?
A.—During an electro-pneumatic or independent application the independent application and release portion slide valve will be blown from its seat.

1343-Q.—What does it depend on as to how much pressure is required to blow the slide valve from its seat?
A.—This will vary, depending upon the tension of the slide valve spring.

1344-Q.—In the event that the independent application and release pipe 20 is broken, what should be done?
A.—No repairs need be made, proceed and carry independent brake valve in running position.

1345-Q.—In this case how does the independent brake valve function?
A.—The independent application is lost but the quick release is still available.

1346-Q.—What features are lost if the actuating pipe 13 is broken?
A.—The independent quick release and electro-pneumatic locomotive brake cut-out features are lost.

1347-Q.—Should the pipe be repaired in order to proceed?
A.—No repairs need be made, proceed but do not use *lock-down* position of the independent brake valve since this will cause a blow at broken *13* pipe.

1348-Q.—If straight air pipe 8 is broken and cannot be repaired, what feature is lost?
A.—The electro-pneumatic brake is lost on the locomotive if the break cannot be repaired.

1349-Q.—What must be done to render the electro-pneumatic brake operative on other units?

A.—The break must be repaired on the straight air pipe side.

1350-Q.—What precaution should be taken?
A.—Do not close the pipe on the *D-24* control valve side.

1351-Q.—What results if controlled emergency pipe 35 is broken?
A.—The controlled emergency feature is lost.

1352-Q.—What should be done?
A.—Proceed with the rotair valve in *PAAS* position.

1353-Q.—What action should be taken if control pipe 16 is broken?
A.—If the break is between the control valve and the relay valve, repairs must be made to have a locomotive brake.

1354-Q.—If the break occurs beyond the branch leading to the brake cylinder relay valve what can be done?
A.—Repair the leak with a short close bend on the control valve side.

1355-Q.—What function is then lost?
A.—The H-24 Relayair Valve cut-off valve function is then lost.

1356-Q.—What is meant by a close tight bend?
A.—A close tight bend refers to tubing which can be doubled over and hammered tight enough to prevent serious leakage.

1357-Q.—Suppose that the break occurs at a flange fitting?
A.—A well fitted hardwood plug may be driven into the fitting to prevent serious leakage.

1358-Q.—What other methods can be used to advantage?
A.—Blank gaskets or discs under flange fittings or in iron pipe unions are methods that can be used to advantage.

1359-Q.—What should be done to move the locomotive to a terminal in the event that the brake pipe branch pipe is closed?
A.—The auxiliary and emergency reservoirs should be drained and open to the atmosphere.

ELECTRICAL SECTION

Plastic Electrical Tapes In Railroad Service

The experience gained on three railroads during the past four years affords a basis for recommended methods of using this type

by Gale Billard
"Scotch" Brand Electrical Tape Division
Minnesota Mining and Manufacturing Co.

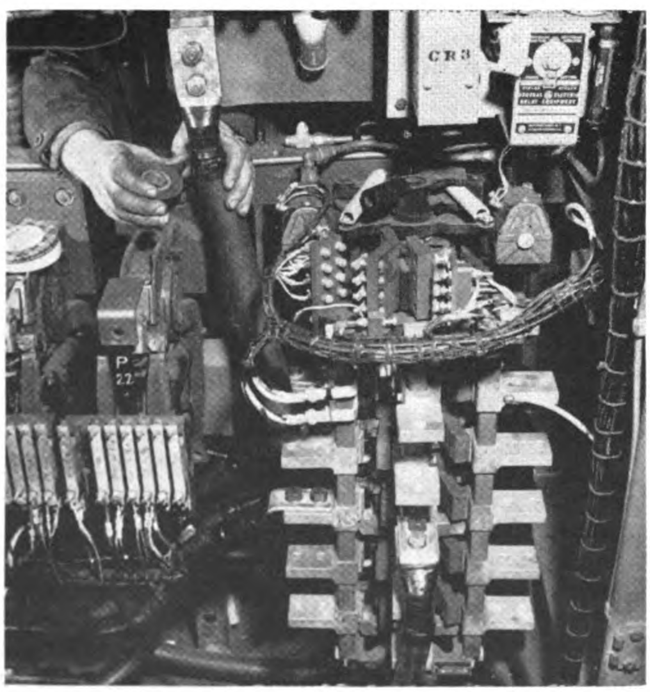
A NEW technique in electrical insulation that has been widely adopted in railroad maintenance in the past four years, has resulted in both longer-lived insulation and lower costs.

The method consists essentially of using a single insulation material where previously two or three materials were necessary. This was made possible by the introduction of plastic electrical tapes shortly after World War II. The economies result from three factors:—less insulating material is used; application is faster; and the insulation requires less frequent replacement.

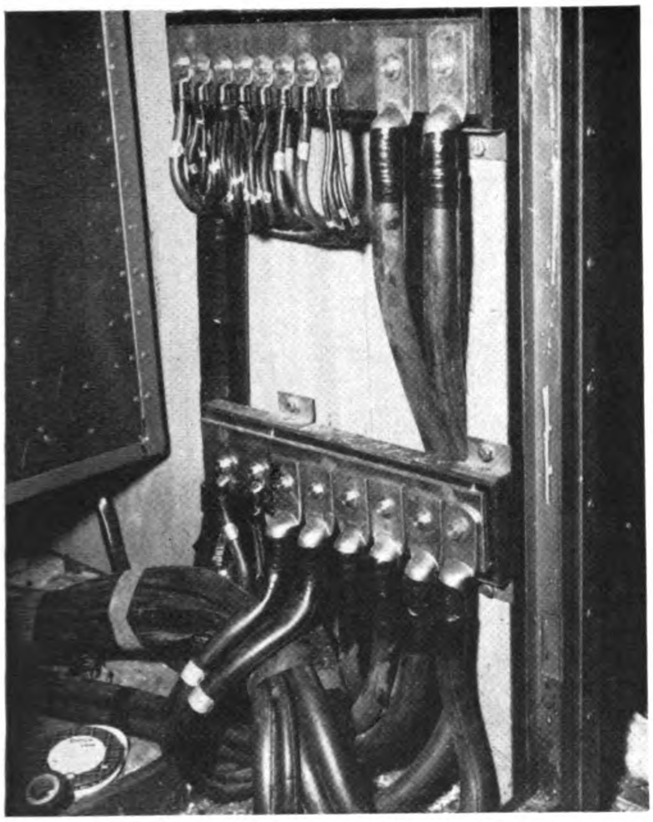
In the Rock Island shops, for example, ten rolls of various kinds of tape were formerly used on the average car rewiring job. Using plastic electrical tape alone, however, this figure has been reduced to only three rolls—a saving in materials of 70 per cent.

On a typical car rewiring job there might be 700 splices to be wrapped. With a saving of even half a minute on each splice, the car would be out of the shop and back in operation six hours earlier. According to Sam Hughes, Rock Island car wiring foreman, the double-duty plastic electrical tape has cut application time in half.

By no means limited to car wiring, plastic electrical tape has met the need for tough, durable insulation in diesel wiring applications as well. On one occasion, a



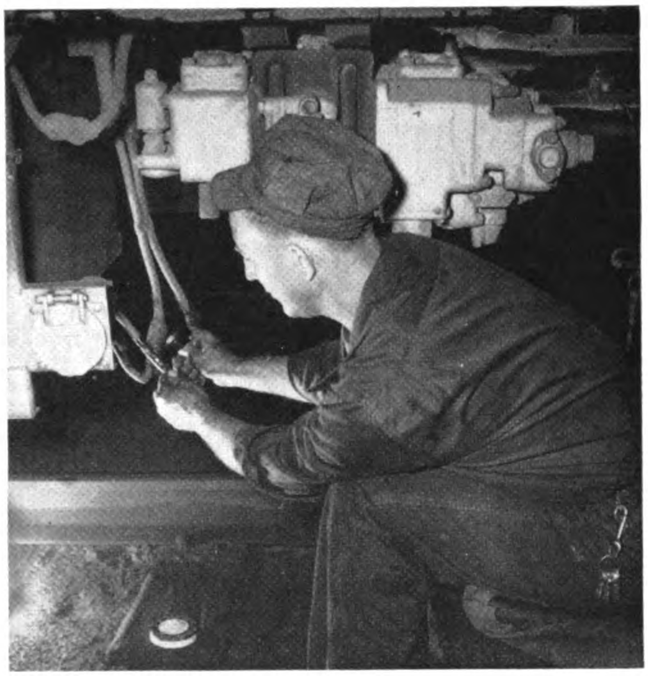
Left:—No. 33 tape applied to the neck of compression type, two hole connector lug in the main electrical compartment of a 2,000-hp. Fairbanks Morse passenger diesel locomotive. Right:—Here a splice is wrapped with plastic tape on high voltage controls of a 2,000-hp. Rock Island diesel locomotive



Soldered lugs on positive and negative junction bus bars between the Enginator and storage batteries are insulated by a wrapping with No. 33 plastic tape. Lines to air-conditioning machinery are harnessed into compact main trunk line at left, competely encased in wraps of the same tape for protection from wear and tear

Above: A moisture-proof seal for traction motor tube ends is provided by two layers of half-lapped No. 33 tape at each end of tube

Below: Road-blasted charging receptacle cables are protected from abrasive effect of flying particles by heavy wrap of tape



Rock Island road diesel came in with the traction motor leads so badly burned that the insulation was charred, blistered and cracked. No replacement units were available and the diesel was needed for immediate use. The leads were stripped down and re-insulated, using "Scotch" No. 33 electrical tape, and the locomotive went out again.

Although it was expected that it would be necessary to replace the leads the next time the diesel was in the shop, the taped leads were still in service when the traction motors were shopped some quarter of a million miles later. The tough plastic had withstood the operating voltages, moisture and undercar blast of the 90-mile-an-hour diesel, and was still in good shape.

In this report, the author is concerning himself with the plastic electrical tapes with which he is most familiar, "Scotch" Electrical Tapes No. 33 and No. 22. and with the railroads that he knows best, the Chicago, Rock Island and Pacific; the Atchison, Topeka and Santa Fe; and the Illinois Central. The descriptions of the various maintenance uses of these tapes are taken from one or more of these railroads with their permission.

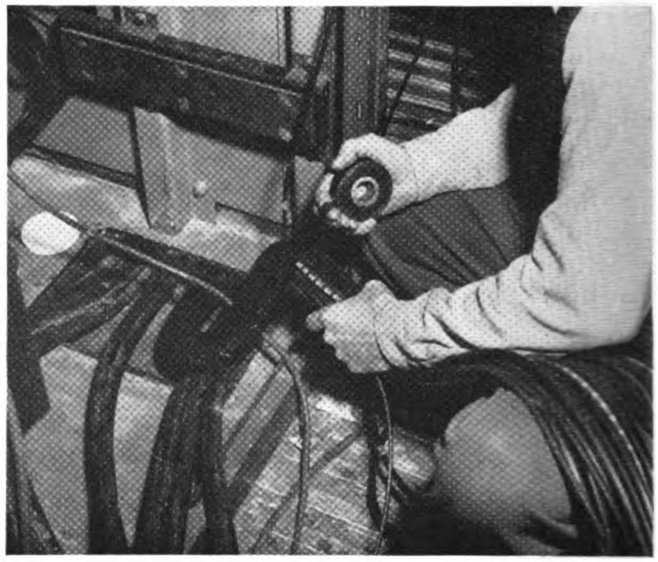
The two plastic tapes, No. 33 and No. 22, are essentially the same except in dimension. No. 33 is 7 mils thick and ¾-in. wide, while No. 22 is 10 mils thick and made in a variety of widths. Both tapes have a smooth, black, vinyl plastic backing, and both have a pressure-sensitive electrical grade adhesive which offers high "tack" for easy application.

The dielectric strength is 7,000 volts for No. 33, and 10,000 volts for No. 22,—approximately 1,000 volts per mil of thickness, measured by the A.S.T.M. short time tests. Insulation resistance is 200,000 megohms for both tapes, tested at 90 per cent relative humidity, 72 deg. F. Other properties common to both tapes are resistance to water, salt, acids, alkalies and oil; no aging at room temperature; unaffected by sunlight; will not corrode copper; will not support combustion; and will not loosen with age.

Railroad applications demand an unusual range of insulation properties. Not only must the electrical properties of the insulation meet high standards, but the material must be able to withstand mechanical abuse, have good thermal endurance, and high chemical and moisture resistance.

The plastic tape,—complete insulation and protection in itself,—meets these requirements in a single wrapping operation. The inner wrap of the tape provides the necessary electrical insulation; and the outer wrap protects against abrasion; and both the backing and the tight ad-

Splices and connections in crowded junction boxes of centralized train control system are compact and easy to pack in when insulated with 7-mil or 10-mil plastic tape



Control wires from Enginator, air-conditioning compressor and other undercar equipment are held and protected with a neat, trouble-free sheath of plastic tape

hesive bond between wraps provide the necessary barrier against oil and moisture.

In addition, the insulation should be easy to apply. Since the railroad electrician is often working in a limited space and often taping from an awkward position, the handiness of completing the job with a single roll of tape is an important factor.

Which of the two tapes to use is usually determined by personal preference and experience. The heavier No. 22 tape is used where maximum abrasion resistance is needed. The thinner No. 33 tape is used for most other applications, especially those requiring ultra-thinness in the finished insulation, as in junction boxes.

The several hundred different electrical maintenance jobs for which the tape has been used on railroad rolling stock can be divided into two broad classifications,—diesel locomotive applications and passenger car wiring.

In diesel applications, the plastic backing of the tape enables it to withstand the splash and spillage of lubricants without deterioration. When such tape is tightly wound and half-lapped, the oil cannot penetrate the layers and thus cannot affect the adhesive properties.

Another source of trouble is moisture. The warm air created by the diesel engine cools and condenses, causing moisture to form on the wiring system. This causes trouble in two ways:

(1) If the conducting moisture works in between the layers of insulation, it forms a path for current flow. With the tight-fitting, adhesive-sealed wrap that is obtained with the plastic tape, there is little possibility of this occurring. (2) The moisture, if absorbed by the insulation, causes changes in the electrical properties of the material, which may result in a breakdown.

The relatively low moisture absorption of the plastic tape,—approximately 0.3 per cent by weight after immersion,—minimizes possibility of this type failure. Many types of jointing materials formerly used absorbed 5.0 per cent to 7.0 per cent moisture,—16 to 23 times as much.

In actual diesel applications, both the main generator and the auxiliary generator leads or bus,—as well as the reversing field leads,—are insulated either with No. 33 or No. 22 tape. Several half-lapped layers applied here provide protection against electrical puncture.

Conformability of the tape allows it to be applied with a minimum of stretch,—an important factor since stretching lowers puncture strength. In addition, stretch causes mechanical stress, and the dielectric strength of a material can be greatly reduced under these conditions irrespective of thickness. Usually 10 per cent elongation is sufficient for corformability without producing undue stress.

Another widely used application is splicing and protecting the starting battery cables and lugs. The thin plastic tape, having high resistance to acids, is half-lapped once around the cable, thus preventing deterioration of the original insulant and providing longer life.

In repairing and splicing battery cables with No. 33 tape, two things are considered: (1) The design of the joint, which is determined by the type of connector used, and the amount of penciling of the cable insulant, etc. (2) The amount of insulation and protection needed. Railroad electricians consider both the electrical and mechanical conditions prevailing.

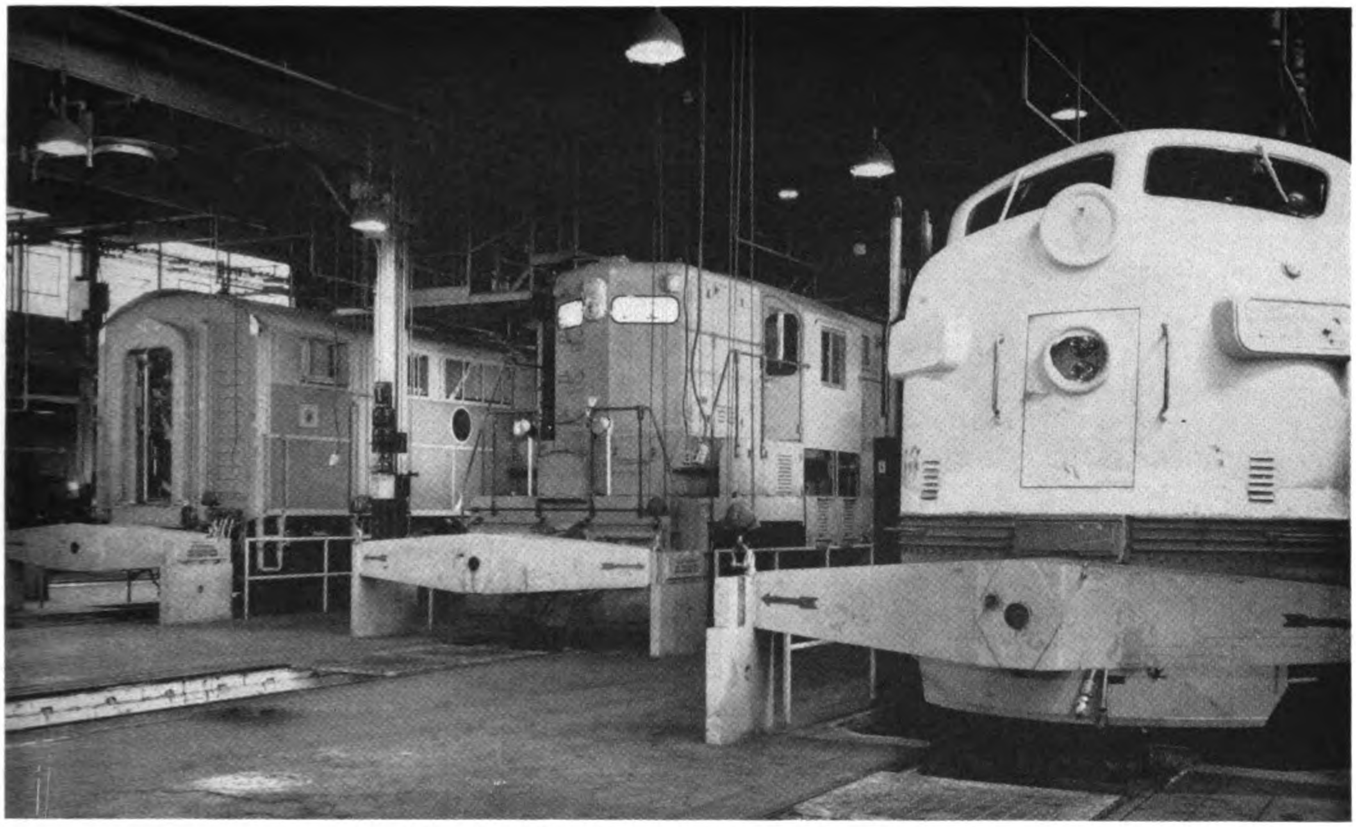
For example, a joint with no protruding sections, and no forces pressing it against the side of the enclosure, needs a minimum build-up,—usually two or three half-lapped layers. If the joint, however, has sections subject to contact with the box, or considerable abrasion, another layer or two is added. Heavy cable joints are blocked or racked if they show any tendency to rub on the enclosure.

Plastic electrical tape plays an important part in the high voltage control cabinet and in insulating the control wires. Insulation failure of a control wire is repaired by removing the old insulation and applying two half-lapped layers of No. 33 to the small wire. The tape is also used to improve the appearance of the terminal connector where it joins the wire. One turn of tape around the neck of the terminal does the job.

Control wires are taped into neat, compact harness-assemblies to insure trouble-free operation. The plastic envelope formed by the tape makes handling easier and protects the original wire insulation against oil, moisture, and deteriorating fumes.

When the moisture and dirt are present, surface leakage paths may form, causing damage to the insulation.

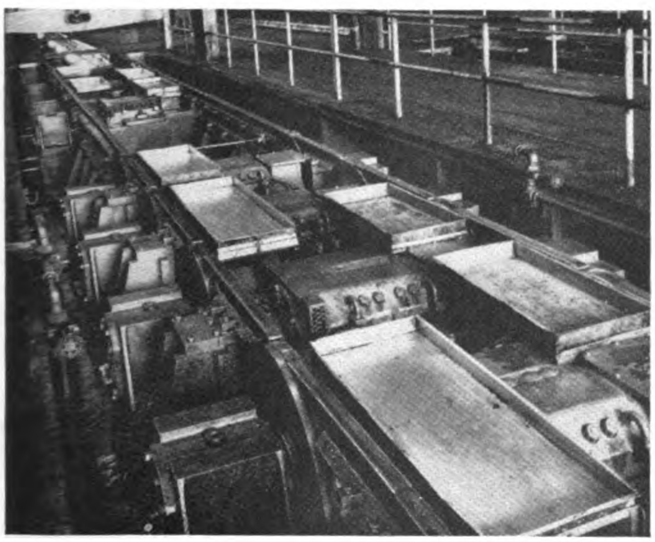
(Continued on page 99)



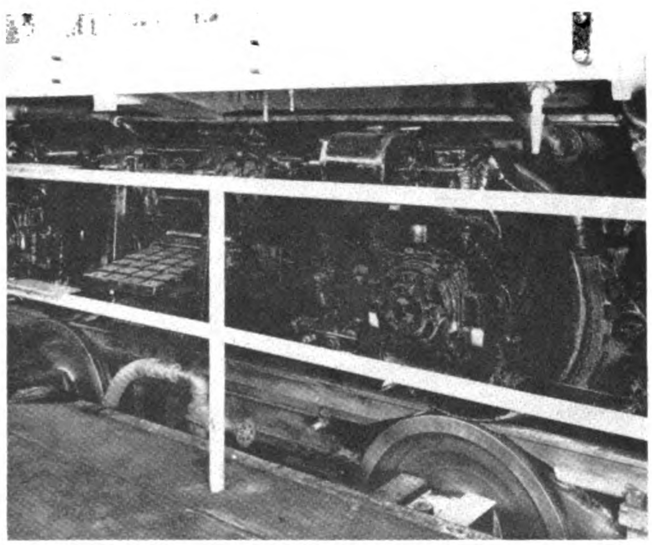
Three locomotives being tested on the three treadmills in the La Grange, Ill., plant of the Electro-Motive Division, General Motor Corporation

"Treadmills" Test Locomotives

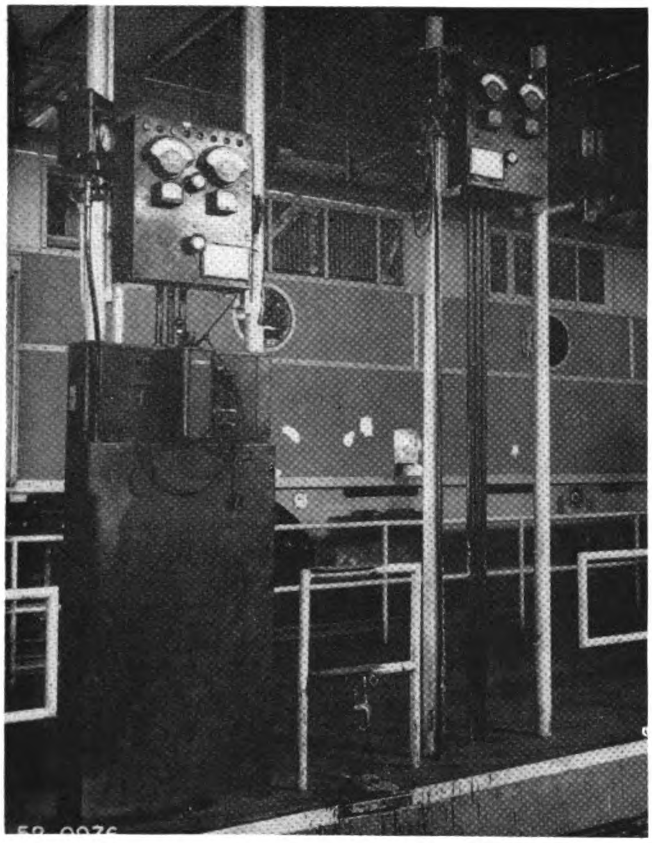
Three dynamometers developed by Electro-Motive are used to load-test new and rebuilt diesel electric locomotives



A general view of one of the treadmills



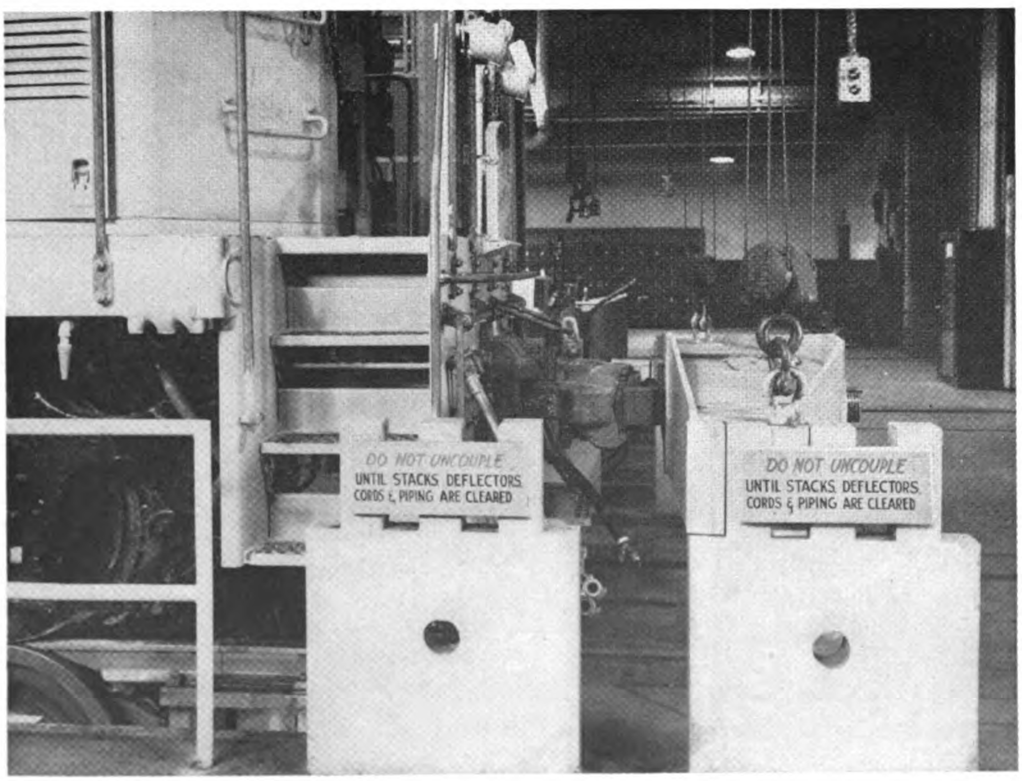
How the wheels of a locomotive truck engage with those of the mill



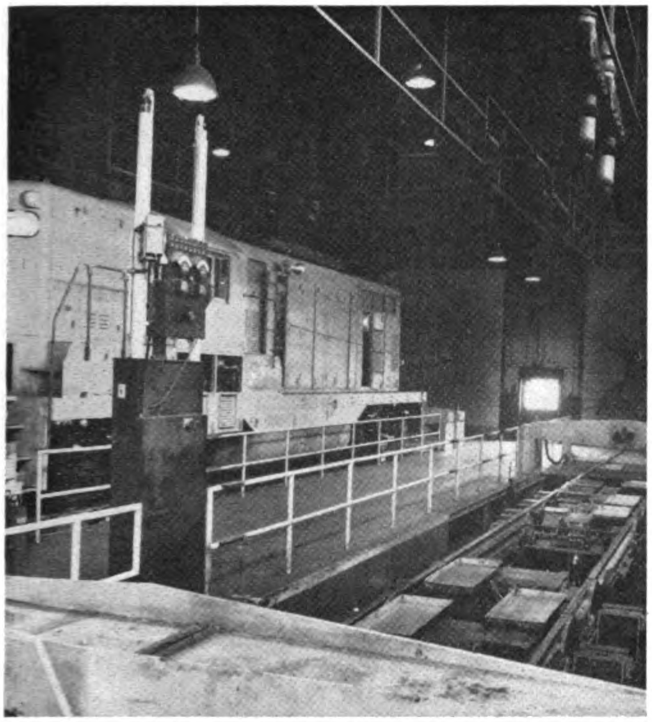
Above: A control stand panel as it appears through a locomotive cab side window. At left: A door height and a window height mill control stand. The bracket instrument at the left of the panel are mill speedometers. There is a hostler controller below the left panel. The two stands provide for different types of locomotives

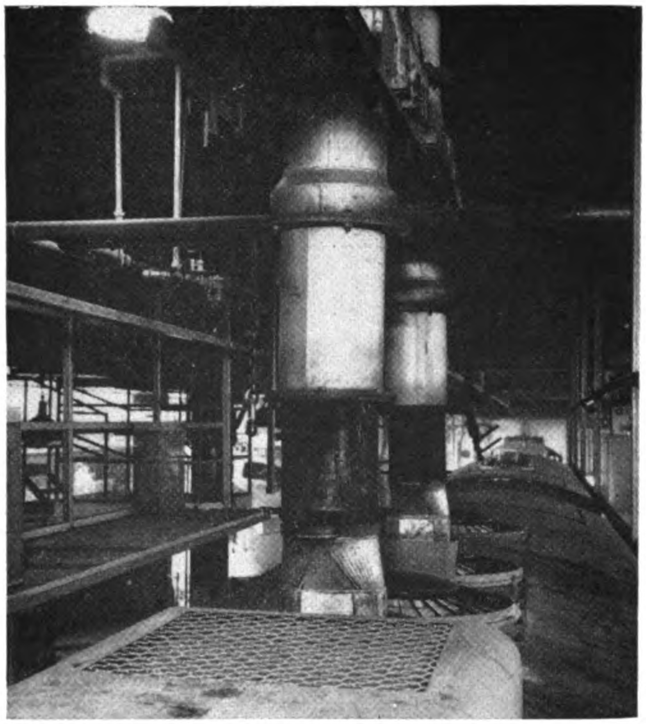
AFTER they are completely assembled and before they are painted, all new and rebuilt diesel-electric locomotive units coming out of the La Grange plant of the Electro-Motive Division, General Motors Corporation are given load tests. Three dynamometers, referred to in the plant as "mills" are used for this purpose. By this means, carefully controlled load tests are made without the need of a test track or road test with a dynamometer car.

The mills are, in effect, locomotive trucks turned upside down in a pit. The locomotive to be tested is placed on the mill wheels, which turn when the locomotive is operated. The motors of the mill trucks then operate as generators and are loaded on dynamic braking resistors. Excitation for the mill motors is supplied by a motor generator set.

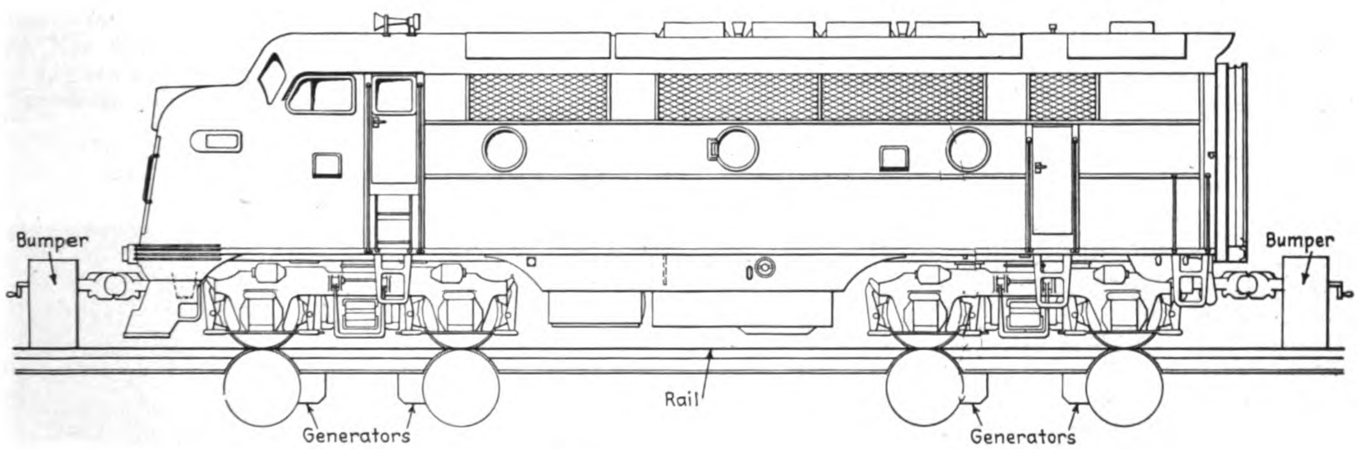


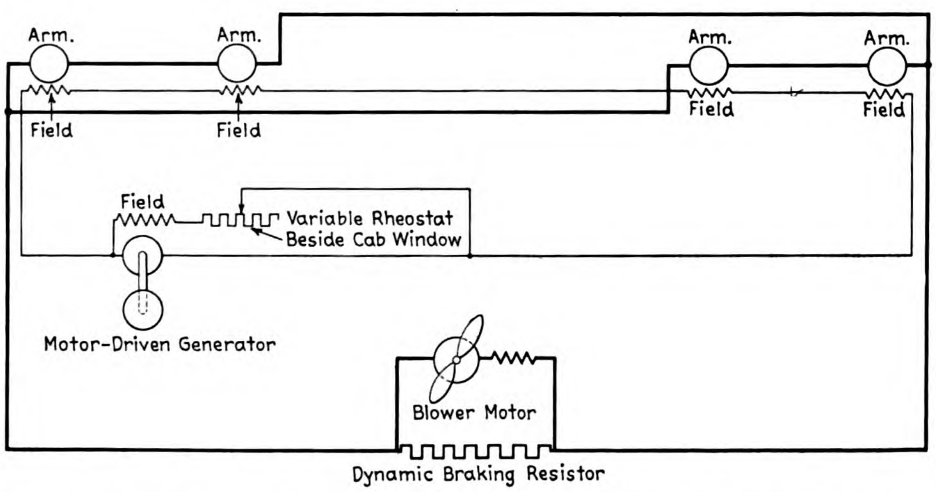
Bumper blocks with a cross beam in place showing how the hoists are used to lift the beam when a locomotive is to be moved. The two blocks and the several notches in the blocks accommodate ocomotives of different lengths





Left: A treadmill with a single control stand. Right: Telescoping connections which may be moved vertically and longitudinally, connect the locomotive stacks with the exhaust hood in the locomotive building





Above is shown a locomotive as it stands on the wheels of the treadmill. Below is a schematic wiring diagram for the principal treadmill circuits

The wheels of the mill motors have no flanges and the upper edge of their rims are flush with the mill track as shown in the diagram. Sections are cut out of the track to make this possible. When a locomotive is to be tested, it is driven on to the mill track, and stopped when the wheels of the locomotive engage with those of the mill. Removable cross beams in the bumpers on each end are then lowered into place by hoists. The couplers of the locomotive are engaged with those on the bumpers and screw adjusters on the bumpers are then turned until the locomotive rests on the mill wheels without touching the track rails. This is done while the locomotive is operated in both directions.

During the test, the locomotive is operated under its own power, driving the mill generators. To control the load, the field of the mill generators is varied by means of a rheostat in the field of a motor-driven generator. This rheostat is placed outside the cab door or window of the locomotive being tested so that the operator may adjust the load while he operates the locomotive throttle. Any desired combination of speed and load may be obtained at speeds up to 50 m.p.h. Each mill has its own motor-generator set for excitation. Blowers driven from shop power are used to cool the generators.

On the load generator control stand outside the locomotive cab window, there are instruments showing generator armature volts and amperes, field volts and amperes, and two field rheostats respectively for coarse and fine adjustment of generator field strength. Below the panel on the outside control stand on two of the mills, there is a hostler controller. These are used to control engine operation on B units not equipped with hostler control.

There are speedometers on each of the mills. These are equipped with overspeed trips which will open the locomotive generator field in case excitation should be lost on the mill generators.

The three treadmills are essentially similar and differ only so they may accommodate different types of locomotives. The mill known as No. 1 will test F7, FP7 and E8 locomotives. Mill No. 2 will accommodate GP7 and F7 locomotives and No. 3 is designed for F7s. The No. 1 mill has eight generators and eight track openings to accommodate the different wheel bases of the types of locomotives tested. Unlike the other mills, it is equipped with selector switches which may be used to cut in the four generators being used, and cut out the other four.

Exhaust gases from the engines are carried out through the roof by means of stack adjusters which connect the locomotive stack to the exhaust hood. The hood may be lowered or raised and moved horizontally to accommodate different locomotives.

Test Procedure

The locomotive is first run in both directions with the throttle in the second notch while a check is made of the wheel slip relay functions. This is done by unbalancing the wheel slip circuit.

The second step in the test consists of checking the actions of the ground protective relay. This is done by applying an artificial ground successively to each side of the power circuit and watching the relay action. A visual check is also made of all rotating equipment, of oil pressure, water temperature and fuel supply.

After a warm-up, when the water temperature reaches 140 deg. C., a manual sequence check is made. This consists of going through all of the transitions forward and backward while the engine is operated in the second notch.

The throttle is then advanced to the fourth position and the engine is run for 20 minutes. The engine water temperature alarm switch is set and the cooling fan speed and the operation of the a.c. cooling fan contactors are checked. At the end of the 20-minute period, the unit is shut down and a general check is made of journal and motor bearing temperatures and motor temperatures.

The engine is then restarted and the unit is operated for ten minutes in the sixth position, at 10 m.p.h., for 10 minutes in the seventh position at 14 m.p.h., and then a full load run of two hours is made in the eighth position. This is done at 18 m.p.h. on the F7, and at different speeds on other units, depending upon the gear ratio. The direction of rotation of the motors is reversed every fifteen minutes.

During the run, all functions are checked and temperatures noted. Any leaks are noted and recorded for subsequent repair. Temperature controls and relay current settings and transition operation are checked. The a.c. generator voltage is adjusted near the end of the run after temperatures become stable.

Steam generators are operated during the tests and all functions checked.

During the process of manufacture and before being assembled in the locomotive, all generators, motors and engines are load tested.

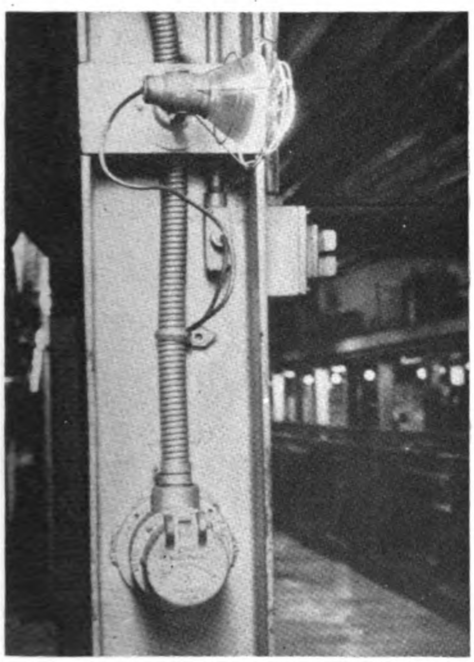
At the conclusion of a test, when it becomes necessary to run a locomotive off the mill, it is, of course, standing on wheels which will rotate, and thus prevent movement of the locomotive. This apparent difficulty is overcome by applying field to the mill generators to produce the necessary tractive force. On one mill, the position of the generators is adjustable, so that when a locomotive is run off the mill, the locomotive wheels must pass over an open gap in the rails. To make this possible, a heavy bar or rail is parallel, inside and a little below each rail. As the locomotive wheel passes over the gap, its weight is supported by the wheel flange running on this inside rail which spans the gap.

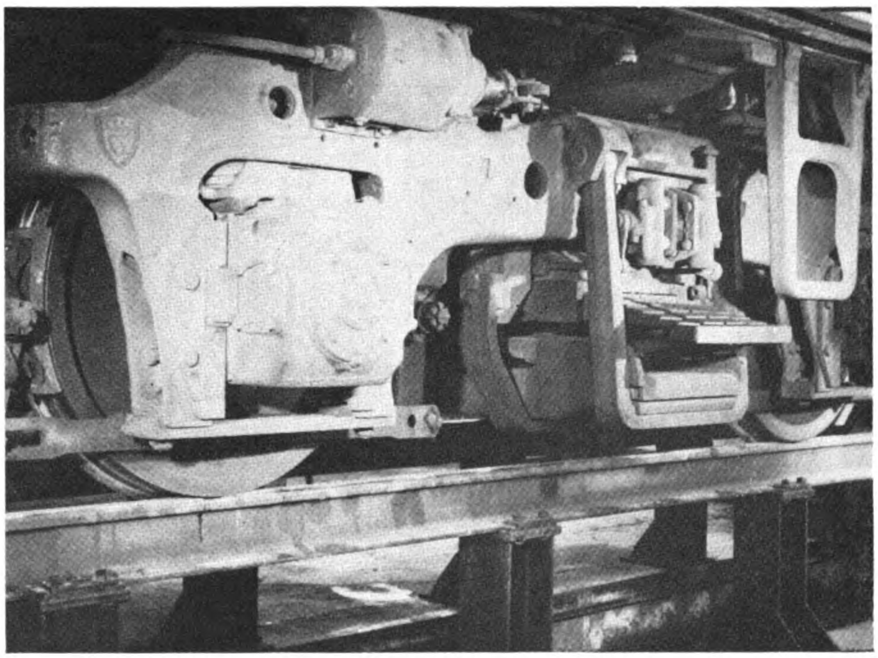
Another photograph, taken April 21, 1952, of flood preparation in the Union Pacific's Omaha, Nebraska Shops. Large machines were raised on blocks as shown and many car loads of equipment were shipped out of the shops to higher ground. During the high water, no dike or levee in the Omaha, Neb.—Council Bluffs, Iowa area failed. Elevation and removal of machinery proved to be good insurance. Household goods of 20,000 people were removed from homes in the Council Bluffs area. There were 31 miles of built-up dikes around Omaha and Council Bluffs

Night view of the shop. The overhead lighting is produced by pairs of 96-in. slimline fluorescent lamps in Westinghouse metal trough fixtures

Facilities for the Diesel Service Shop

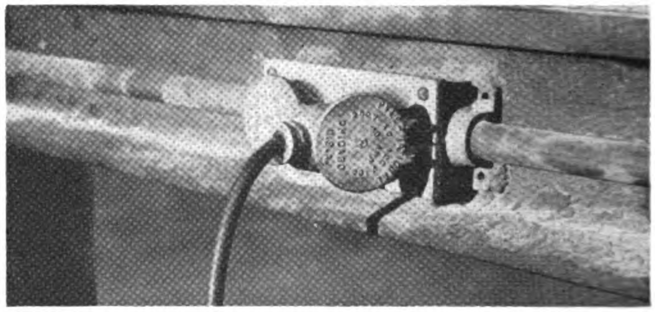
Atlantic Coast Line Shop at Florence, S. C., has adopted and developed many devices which facilitate the servicing of diesel-electric locomotives



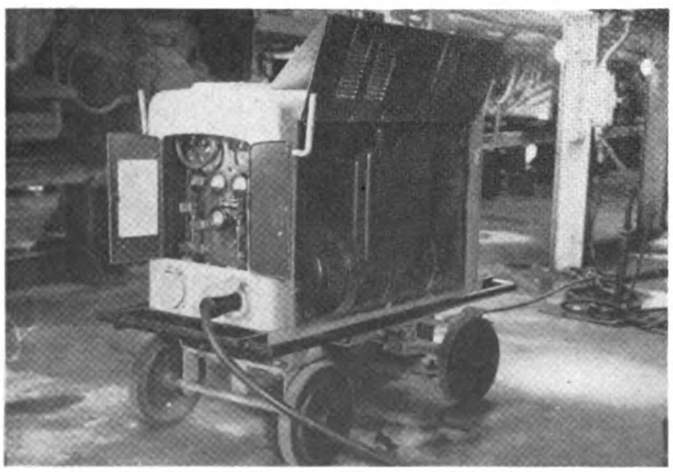


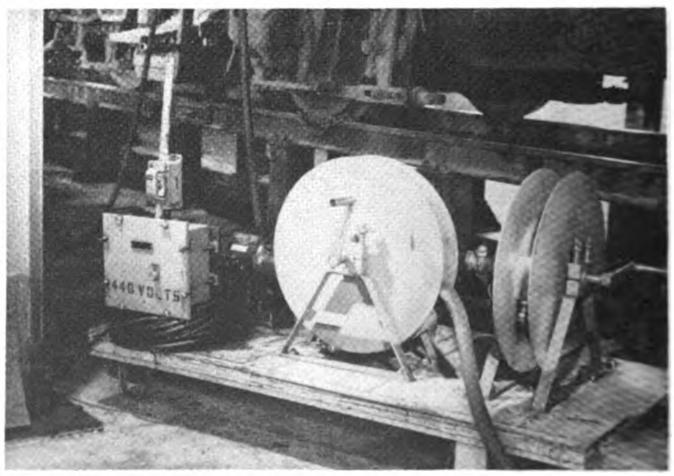
Above, left: On the side of every column, six feet above the floor, there is a 150-watt reflector flood lamp in a Sterber swivel socket with a wire lamp guard. The socket makes it possible to direct the beam of light from the lamp in any desired direction. The receptacle below the lamp is a 600-volt, 60-amp., Pyle-National Pylet used as a 220-volt, 3-phase power outlet for operating the locomotive ventilating fans when the engines are shut down. Above, right: An example of the kind of below-platform lighting produced by a two-lamp fluorescent unit and a reflector flood lamp at each end of the fluorescent unit

Above, left: Two Louis Shepard Totemaster engine-powered trucks, fitted with special flame-proof exhausts, do all the hauling of materials, and supplies. The piping, which may be seen on the ceiling, supplies water, compressed air, fresh lubricating oil and carries away waste lubricating oil. At the end of each air line, there is a vent used to remove moisture which may be trapped in the line. Above, right: The oil pumps which supply fresh lubricating oil may be started and stopped from any one of a number of pushbutton stations located like the one shown above the platform or from others mounted on the supporting columns under the platform

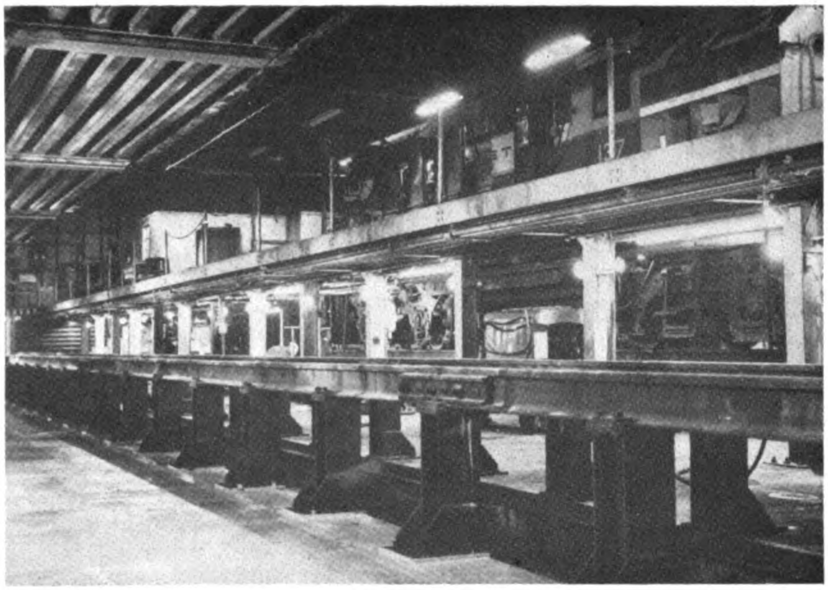


Above: Pyle-National, 250-volt, 30-amp., twin-outlet Pylets are mounted at intervals on the web of the elevated rails. They are on the inside of the rails over the pit and supply 115-volt power for portable extensions. At left: General lighting below the platforms is supplied by pairs of 96-in. fluorescent lamps in Westinghouse through-type fixtures mounted between every other pair of supporting columns





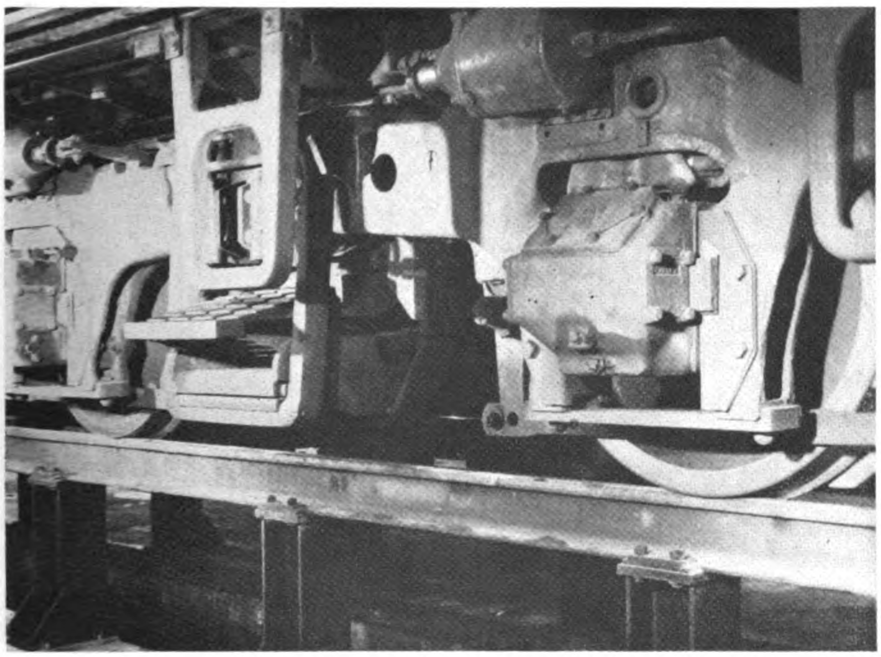
Above, left: The portable welding set, made by the Motor-Generator Corporation, Troy, Ohio, consists of a 440-volt, 3-phase, 1,750-r.p.m., a.c. motor, driving a 45/90-volt, 300/150-amp. welding generator. Above, right: Waste oil is removed from the locomotive and forced into the waste oil lines by a railroad designed assembly of equipment on a three-wheel, rubber-tired truck. The two hoses required, when not in use, are wound on two reels. The Blackmer pump is driven by a General Electric, 3-hp., 440-volt, 3-phase motor having an across the line starter with push-button control

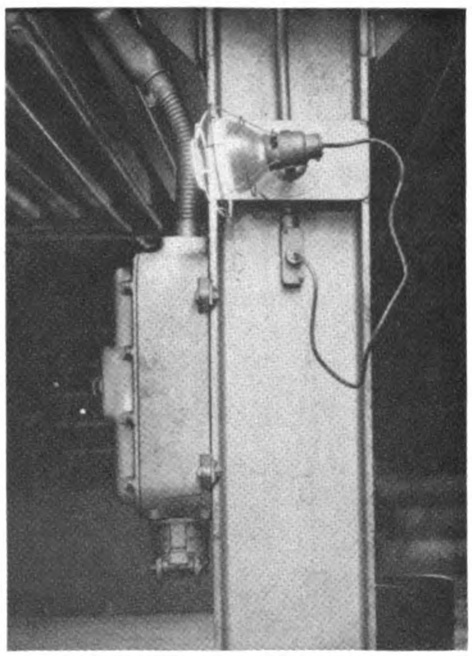


Above: One side of the shop showing a pit, elevated track and a deck level platform. At left: A piece of fire protection equipment assembled by the railroad which consists of a John Bean fire pump and a hose reel made by the Division Food Machinery and Chemical Corporation mounted on a truck. The pump is motor-driven by a 440-volt, 3-phase, a.c. motor and supplies water either as a jet or as mist at a pressure of 600 lb. per sq. in. The hose nozzle rests in a cradle and the act of lifting the nozzle closes a switch which automatically starts the pump

THE greater part of diesel-electric locomotive service shops follow a general pattern of elevated tracks, shallow pits between tracks, locomotive deck-level platforms, through tracks, etc. But the facility with which work is performed in the shop is dependent in considerable measure upon the methods and devices which are selected or developed to perform certain functions.

The equipment, largely electrical, shown in the accompanying pictures, constitutes a part of that which is used in the Atlantic Coast Line service shop at Florence, S. C.





Above, left: View of a locomotive truck in the under-platform lighting, looking toward the center of the unit; the other similar picture shows the truck looking toward the end of the unit. Above, right: One of the reflector lamps, in its swivel socket and at the left is a Pyle-National circuit breaker and receptacle which is an outlet for 440-volt, 3-phase power for the portable welding set and for a waste oil pump, both of which are shown in other pictures

DIESEL-ELECTRICS—How to Keep 'Em Rolling

10 Inspection and Tests

It's Quite Simple

The maintenance of electric machinery is really a mechanical job. This is true, not only for bearings and gears, but also for the electrical parts. Moreover, motors and generators are so much alike that their parts can be treated the same. Actually, the care of these parts is no more mysterious than that of bearings and gears.

Whatever occurs electrically leaves its mark in some mechanical change that tells the story. The commutator surface, for instance, is like an open book. It shows the general health of the machine more clearly than any other part. Here sparking, abusive overloads and flashovers all trace their record. So the commutator is the first place to look when you remove inspection covers.

Let's Take a Look

Like gears, commutators give warning of trouble in advance. They seldom fail suddenly. This gives time to locate the trouble and correct it. Neglect to do this may lead to gradual destruction of the commutator surface, breaking of brushes, flashovers and final complete failure.

The commutator surface is all important. When it has a smooth polish, either light or dark, it is reassuring. Even a regular pattern of light and dark bars is no cause for alarm as long as the bars are polished. This may only mean that the motor is operating close to its commutation limit. The pattern may come and go with service and operating conditions. Remember, temperature, weather, gases, brush grade and current flow all affect the thin film. And, it is this film that gives the copper surface its appearance. However, if you find a pattern of serious bar edge burning, look for trouble. Neither is all well when the surface shows irregularly spaced groups of dark, dull or burned bars. This means that the brushes are no longer riding the commutator. They are bouncing, jumping and sparking viciously enough to burn the surface. Such a condition seldom corrects itself. Instead it gets worse and worse. At first the bad spots are far apart and the surface between them still polished.

If a traction motor happens to stop with such a bad spot in full view, you are lucky. Then you can get a head start on the trouble. More likely, it will stop with the defect hidden. When you suspect motor trouble in

This is the tenth of a series of articles on maintenance of diesel-electric equipment. This article is written by J. W. Teker, Locomotive and Car Equipment Department, General Electric Company, Erie, Pa.

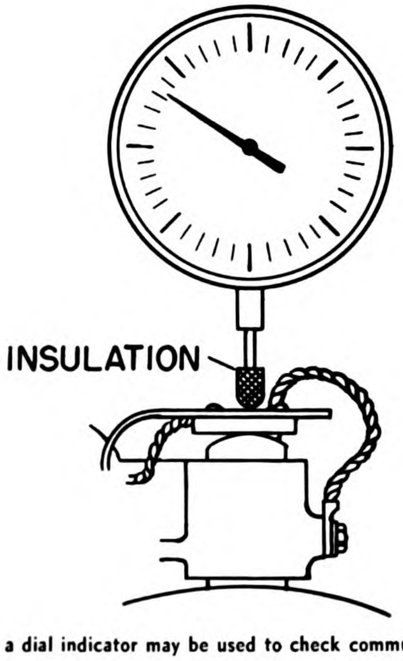


Fig. 1—How a dial indicator may be used to check commutator surface

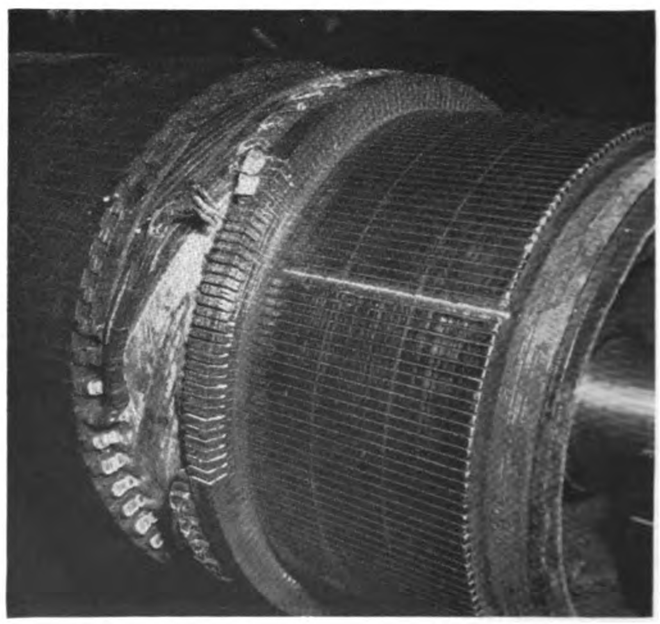


Fig. 2—Burned commutator bars resulting from open circuit in armature winding

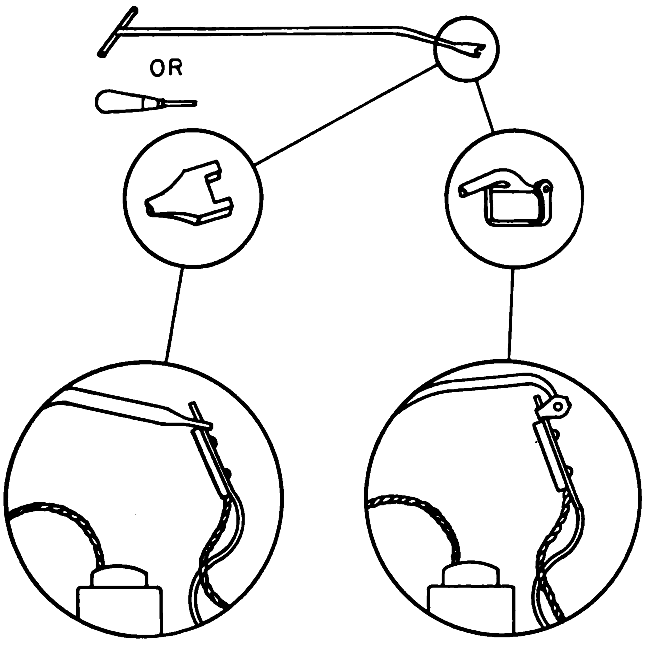


Fig. 3—Lifting tools and how they are used on traction-motor brush springs

service, it will be worthwhile to move the locomotive slowly while the man in the pit watches the commutator. If you are suspicious of a commutator, don't be satisfied with a one-sided look. The trouble may be playing hide-and-seek.

Generator commutators are easier to look at because covers can usually be removed on both sides. The part hidden under brushholders can be uncovered by "barring" the engine over a few notches.

There's More Than Looking

This is about all you can do by looking. To learn more you must feel, listen or measure. If the motor is out of the truck, if the wheels are jacked clear of the rails, or if a drop pit table is lowered, you can run the motor and feel or hear a rough commutator. A generator may be checked while the engine is idling.

A distinct click can be heard as each brush goes over a step in the commutator surface. Or the brushes will chatter as the rough spots disturb them. Hold a fiber or wood stick (for insulation) about the size of a long pencil lightly on the brush or on the spring right over it. This will give you the feel of the brush as it rides the commutator. The bad spots can be clearly felt as they go by. Check traction motors when turning in both directions. as there is sometimes a difference in the degree of roughness.

The most accurate way to check commutator surface is with a dial indicator (Fig. 1). Clamp it to the motor frame so that the indicator tip touches the spring directly over the brush. Be sure the brush is free to move in the holder. See that the spring pressure is strong enough to hold the brush against the commutator surface. Otherwise. it may hang against the indicator and fool you. Mark the starting position and turn the motor slowly but steadily. This is not always easy to do. The brushes may rock back or tilt and lose the zero dial setting. If the turning is opposite to the direction in which the motor was last run, the brushes may chatter as the bar edges go by. Fit the brush in, or reverse the direction to get a

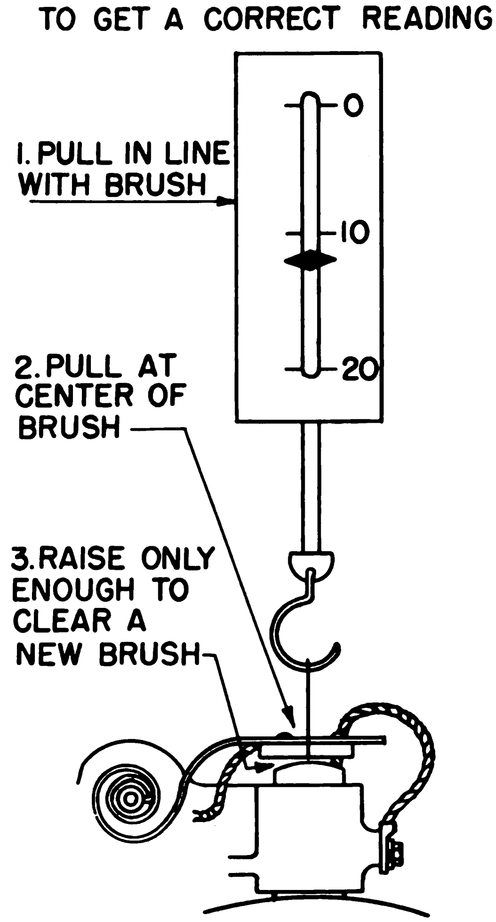


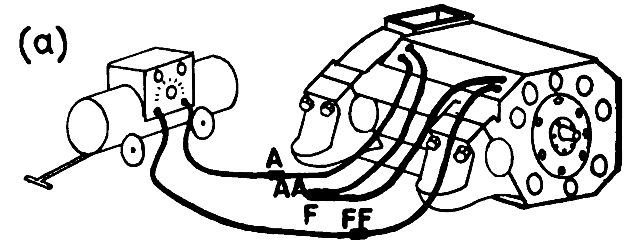
Fig. 4—How to measure brush-holder spring tension with a spring scale

steady reading. A quick reading can be obtained by following the indicator as the locomotive is moved over the pit. If the machine is to be turned with voltage on it, the tip of the indicator should be insulated from the brush. Otherwise serious damage to the indicator will result from current passing through it to ground. A rubber or fiber tip will do the job. Even a good piece of scotch tape will serve if it is stuck on so it won't jar off. Watch the indicator for sudden swings. It is these quick dips in the surface that upset brush contact most. A brush may ride easy, gradual swings without losing contact. But, sudden swings of the same amount are hopeless, even with strong spring pressure. The faster a motor operates in service the truer this is. If you find a rough commutator on a motor due for changeout soon, you may wish to let it go unless it is already causing trouble.

Resurfacing Commutators

When chipped brushes or flashovers resulting from a rough commutator interrupt service, it's time for a resurfacing job. This may be done with the motor in place or removed from the locomotive. In either case, a few precautions should be taken. If the work is done with the motor in place, block the remaining locomotive wheels to prevent rolling off the jacks. Remove or raise the good brushes, or they will grind into carbon dust and mess up the insulation. Since the current to drive the motor is small, one brush each in a positive and negative holder will do. Clean up greasy muck on insulating surfaces so that carbon and copper dust will not stick. Now go ahead with the resurfacing job.

On generators, remove a brush holder and install the grinding tool first. Warm up the engine so it will start easily. Then raise all the brushes that are hard to reach. Crank the engine with a few brushes in holders of each polarity that are easy to reach. Wear gloves, goggles, and a respirator. Rake and blow conducting particles from between bars. When possible, air-cure the commutator up to full speed and voltage.



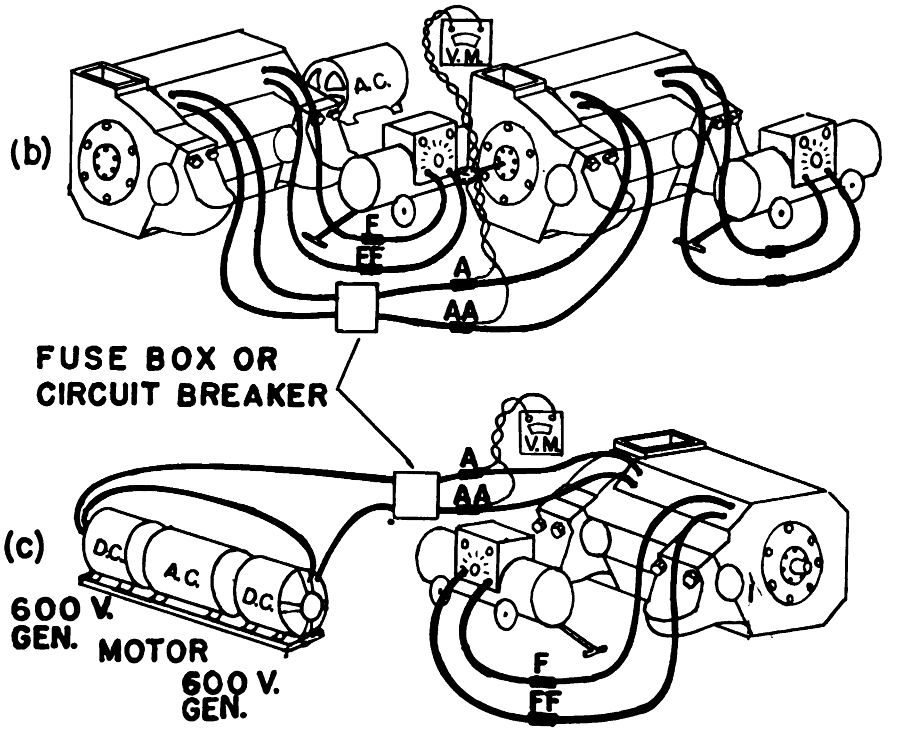


Fig. 5—Various means of supplying power for running tests on traction motors. (a) Above: welding set.

(b) Left. Another traction motor driven by an a.c. motor.

(c) Left: Two d.c. generators connected in series and driven by an a.c. motor

In resurfacing, watch how the last part of the surface cleans up. At times four equally spaced areas will show up on motor commutators. This may point to abusive stalling lasting long enough for the current to heat and raise the bars under the brushes. Scratch a mark on the ends or risers of the bars in this area. If the trouble repeats in the same place after the motor is back in service, you can suspect annealed bars caused by such local over-heating. Then the motor should be removed for rebuilding the commutator. This is a back shop job.

Other Causes of Flashovers

Repeated flashovers in service are not always caused by rough commutators. Now and then an open circuit in the armature winding will cause trouble. This occurs when a conductor is broken—probably by vibration. Then the current can't get through the winding. An arc is drawn as the segments to which the broken coil is connected move away from each brush. This burns the copper away on both sides of the mica segment and makes a deep trench (Fig. 2). Such damage can easily hide behind a brush holder unless you move the commutator so you can spot it. At high speed and voltage, this arc may carry over between brush holders and cause a flashover. Repairing the open circuit is another job for the back shop.

Low insulation resistance between adjacent commutator bars may be another cause of flashovers. Don't confuse this with a good insulation resistance measurement to ground (such as you make with a "megger"). Remember, the high voltage from one brush to the other is divided between all the mica segments. So each takes care of only a small part of the total. This is why the spaces between bars can be as small as they are. But these spaces must be clean. When they are bridged by enough conducting particles, such as brakeshoe, copper or carbon dust, the current flows across them. The machine can then flash or arc across the commutator from brush to brush. Sometimes only a small section of the commutator will be bridged. Perhaps some grease or oil fell on it. This caused the dirt to collect between a few bars. Once more it is something not easy to find; the rest of the commutator may be clear, so you must move the armature enough to see the whole surface. A spot large enough to bridge only one segment has been known to cause repeated flashovers at high speed and voltage until it was dug out. Don't ignore little things where electricity is concerned—it takes only a spark to explode a keg of powder.

Brushes are expensive and should be left in for as much mileage as possible. However, if you pass brushes so short that they wear out before the next inspection, you will have a service failure. Short brushes transfer the arcing to the brush holder and melt it off. At higher speeds, such arcing can easily make the machine flashover. The condemning limit on brush length varies with

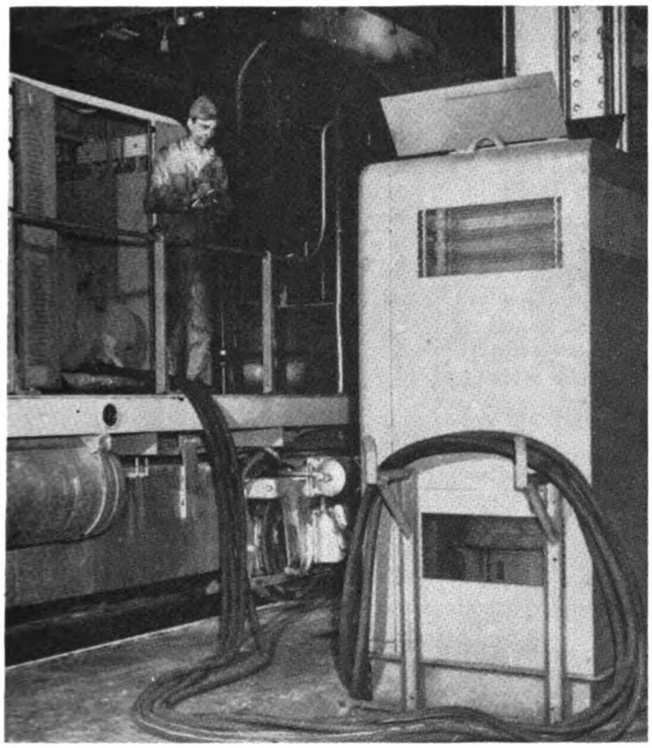


Fig. 7—A portable loading resistor is a handy means of load-testing a locomotive power plant. Load readings can easily be taken from the locomotive platform

the frequency of inspection and operating conditions on your road. When you run into sandstorm, and filtering of the ventilating air is not adequate, brushes can wear down in a hurry. Operating experience is the best guide in balancing brush cost against service failures. Keep records and watch results.

Short brushes are not the only cause of such trouble. Brushes stuck in the carbonways will do the same thing because they can't move to remain in contact with the commutator. Muck dropped on a holder may harden and gum the brushes. Some brushes have been known to swell or sweat and stick themselves in the holders. Even the pig tails bent over the brush holder can hang up a brush—especially on smaller machines where the spring tension may be low.

A pig tail rubbing against the brush holder or against a buzzing spring can be frayed through quickly. Then the broken end is free to wave around. This can cause trouble by dragging on the commutator or against the risers, or by hitting the frame to ground the machine or cause a flashover. Pig tails can also come free of the brush when the corners of the brush break. When making an inspection, it is a good plan to raise the brush spring. Then pull the brush back by taking hold of the pig tail with the other hand. This lets you check the spring tension, the pig tail connection of the brush, the freedom of the brush to move, and to see if the brush is broken. Chips from broken or shattered brushes may get stuck between commutator bars. There they become glowing hot from short circuit currents and can cause a flashover.

After inspection, gently lower the spring and let it force the brush onto the commutator. Don't let the spring snap back as the blow may crack the brush. Where space is limited, as in a traction motor, a springlifting tool (Fig. 3) is a big help. Then both hands don't have to be in the same small space at once. Such a tool is almost a must because of the extra heavv traction-motor spring pressure.

Maintaining correct spring pressure is very important. This is especially so where rail shock and vibration can bounce a brush out of contact with the commutator. Experience with lifting many springs daily gives you a pretty good feel of the correct pressure. Be alert for weak, annealed springs, especially where bad order shunts or pig tails, or burnt springs tip are found. If a new spring is required, the brush holder is usually removed. The spring tension should then be adjusted with a spring scale (Fig. 4) to the recommended pressure. When replacing a brush holder, take care to protect the commutator surface with a pad. Locate the holder in its correct position. By all means see that the cable con-

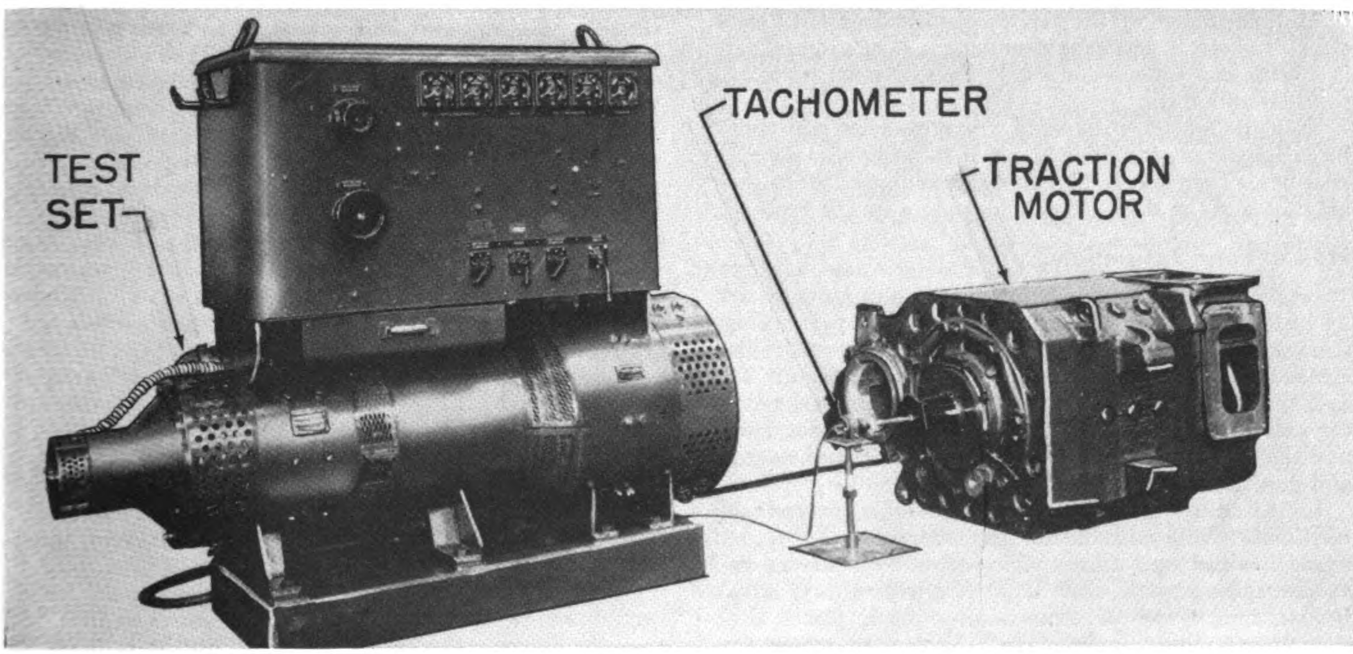


Fig. 6—Special motor-generator set for use in testing traction motors

nection is clean and tightly bolted. Otherwise, there may be enough heating to burn it off when the machine goes into service. This applies to main motor cable connections as well. Locomotive failures have been traced to dirty or loose connections hurriedly or carelessly made.

Watch for Overheating

If you overload a steam locomotive, it will stall. A diesel-electric doesn't act that way. Its generator and motors don't know when to quit. As long as the wheels hold the rails, it will go on pulling. That's what makes it such a brute. But the motors and generator do get hot. If the overload time limit is exceeded, the armatures may get hot enough to melt solder. Molten solder usually throws out like a pinwheel. It splatters on the field coil connections, the frame, or whatever is in line. Beads of solder may also remain stuck to the risers. But, don't confuse this with flashover burns. Look for the silver colored splatter on the frame before making up your mind that the machine was hot enough to throw solder.

A motor or generator may overheat for lack of cooling air. You know what happens to your automobile engine when you lose a fan belt. Check the blowers, their belts or driving motors. Examine the bellows connection between air ducts and the motor inlet. Is there damage which might account for the loss of air? How about the air holes through the armature? They may be clogged with muck and dirt so the air can't get through. Are the motor covers missing? Are they latched tightly enough to hold the required air pressure?

Overheating, no matter what the cause, can do several things to an armature. The contact surfaces of the leads and riser slots can get dull. This will result in high-resistance connections. The current must then fight its way through these connections. This makes hot spots that can damage insulation or even burn off the leads. You can see this trouble because it discolors the risers and leads. Let this serve as a warning.

A worse effect of overheating, because there is no warning, is slackened winding bands. Heat softens insulation which squeezes out from under the band and leaves it loose. Now the winding is free to vibrate. Insulation wears away, or leads may break, and then electrical failure follows.

At times some of the molten solder does not throw clear. Instead it gets caught under the insulation. There it collects and spreads until it bridges between leads and short-circuits them.

Even though an unsoldered armature may pull trains for a long time, it's wise to get it to a shop as soon as possible. Then the leads can be resoldered before they get dull, and the slack bands and wedges can be renewed.

How's Your Insulation?

Insulation condition can be judged surprisingly well by just looking at it. This is because the exposed leakage surface is affected most by conducting dirt layers. These surfaces are usually out where you can see them. For instance, the brush-holder insulators, the string band at the end of the commutator, the insulation between risers and the winding band are all easy to see in both motors and generators.

In operation, these surfaces sometimes get covered with oily dirt. Now and then a flashover blast burns and smokes things up. The tough job is to reach in and around these parts to clean them. Perhaps a dirty streak is left across one of these hard-to-reach places even though everything looks clean. Then someone is surprised when the machine fails in high-potential test or on the road. For this reason, it is a good idea to measure the resistance of the insulation. Several types of megohmmeters are used for this. Some can be plugged into an ordinary light socket. Others are cranked by hand or motor driven. The 500-volt varieties are probably the most popular. They are widely used with excellent results. Now and then, insulation may fail on a high-potential test of 1,000 volts or more even though it has just given a good resistance measurement. Perhaps a 1,000-volt megohmmeter would have shown this defect which did not respond to the 500-volt instrument. Above all, do not paint insulation unless it shows good resistance and also looks clean.

Make a Running Check

Running traction motors up to full speed at every opportunity really pays off. You can listen to the bearings, and check commutator roughness and armature balance. This can be done easily with the motor on the floor. Sometimes the entire motor, wheels, gearing and axle assembly is set up and run. This allows the suspension bearings, axle journal boxes, gears, gear case, and axle and wheel runout to be checked. A welding generator or something like it is the easiest way to get power (Fig. 5a). Such a setup should be securely clamped to the floor.

While this is a fine way of making mechanical checks, it leaves much to be desired electrically. Such a scheme allows only about 100 volts on the motor in order to keep the speed within limits. This is usually about one-tenth of the maximum voltage in service.

A megohmmeter or high-potential test checks insulation resistance to ground. But it doesn't do a thing about the little leakage spaces between the commutator bars. Nor does it check the turn-to-turn insulation of the coils. Surge-type testers are available for overhaul shop use but they don't fit the requirements of running maintenance well. Here the best scheme is an arrangement for running the motor at full or over voltage. In order to get full voltage on the armature, we must have full current through the field. A good way to get this is to connect the main motor field to a high-current, low-voltage generator (a d.c. welder will do as shown in Fig. 5b). Then the motor armature can be run from a high-voltage generator at any desired speed and voltage. This allows you to combine mechanical checks with a full voltage electrical test. It also allows you to air-cure the motor-commutator and reduce the probability of flashovers in service. With covers on the motor and the air inlet closed, the motor will get hot from its own core losses. In fact, you should be careful not to overheat it by prolonged running with all air inlets blocked.

By adjusting the motor field current you can make the armature run at any speed and voltage you want. A portable, self-contained test set with controls is available for this use (Fig. 6). Or, a test set can be put together with equipment usually available on a railroad. The chief problem may be the high-voltage generator. Another traction motor (Fig. 5b) may be used for this by coupling it to an induction motor. Or a couple of 500- or 600-volt machines may be connected in series to get 1,000 or 1,200 volts (Fig. 5c). Locomotive builder's service engineers can help you with such arrangements. The effort of obtaining such a test set is very much worthwhile.

This checking of turn-to-turn insulation in the armature is much easier on a traction generator. By blocking out the power contactors, a generator can be brought up to full speed and voltage with its engine. This is a

quick way to find out if flashover trouble is caused by the generator or by some external fault. Connecting leads from a loading resistor or water box to the generator will allow you to load-test the power plant. Thus, you can put the power plant and cooling system through its paces while you watch and adjust it for best performance. Compact, portable loading resistor sets (Fig. 7) are available for this. Or there are several varieties of water boxes any of which can be built near the testing station.

Field Tips

Field coils and poles usually are not troublesome. Check them for damage by fire. Flashovers sometimes ignite the oily muck plastered between the coils. Blowers feed a forced draft to this fire, and it can do quite a bit of damage before it burns out. Loose field coils on poles are hard to find until vibration wears the insulation through and causes a ground failure. At times, telltale rust between the pole lips and the spring flange collars may serve as a clue. If you suspect shorted turns in the field coils, make a comparative test. Pass enough current through the field circuit to get a suitable voltage reading on each coil. A voltage difference between one coil and the others may point out the bad one. Series motor field coils have too low a voltage on d.c. to give good test results. The accuracy can be greatly improved by making the test with a.c. of 60 cycles or more. Of course, a.c. meters must be used. Also, the brushes should be raised off the commutator so that the armature coils do not act as shorted transformer turns.

When defective field coils are changed out, it is surprising how many times the polarity of the poles is mixed. By all means, check magnetic polarity with a compass or a pair of nails to be sure it alternates from pole to pole.

No Deep Stuff

You can see that the inspection and test of electrical parts on running maintenance is nothing to shy at. It is just as free of "hocus-pocus" as what you do on the mechanical parts. When you understand the job each part does and know what to look for, defects will stand out like sore thumbs and you will spot them immediately. And what can't be seen, can usually be checked by a few simple tests.

Fortunately, most troubles give warning before causing failure. This allows time for preventive action. Efficient and intelligent maintainers understand this, and take advantage of it. Thus, they find that electric equipment is actually reliable machinery—easy to understand and maintain.

Plastic Electrical Tapes In Railroad Service

(Continued from page 86)

Carbonization takes place, and a permanent path of electrical conductivity or "tracking" results. Both No. 33 and No. 22 tape are basically resistant to tracking. Neither will support combustion.

In the electrically operated equipment, such as rotating lights and headlights, limited space makes the thin-caliper tape specially valuable, as several wraps can be applied without creating a bulky joint.

One of the most critical jobs for plastic tape is on the traction motor leads. At the point where the traction motor lead is connected to the feeder cable, a sleeve is slipped over the leads before the mechanical connection is made. The sleeve covers the joint and is held in place by a grooved rack. However, obtaining a moisture-proof seal at this point is a problem. Therefore, plastic tape is used to seal the sleeve to the cable. Usually two layers of lapped tape are used at each end of the tube.

Economy, too, is an important factor. M. C. Sharp, assistant to the general superintendent of motive-power of the Rock Island, states that sealing traction motor tubes was formerly a three-step operation, using insulating materials. Using No. 33 tape, material cost has been cut 30 per cent, and labor cost by 50 to 60 per cent.

The Santa Fe previously used an assortment of four rolls of three different insulating materials for the job, while now a single roll of No. 33 provides the same protection, and in considerably less time.

A number of points in the diesel centralized train control system are protected with tape. The motor generator used in C.T.C. operation requires that the lead joint be taped with several layers of No. 33, and any splicing done within the wiring is also taped.

Moisture is often present in these sealed systems, due to condensation and "breathing". In this instance, a compact, moisture-resistance splice is essential. No. 33 keeps the moisture out and the current flowing in the intended path.

Cab signal receiving coils presents a problem that has been solved by the Illinois Central. C. A. Pearman, electrical engineer of equipment, wanted an outer wrap for the coil that was easy to apply, would provide adequate insulation and provide a moisture barrier. Room was an important item because the tolerances of the assembly were limited. The 7-mil No. 33, applied in a half-lapped layer around the coil, was the solution.

Many of the same problems encountered in diesel wiring also are present in car wiring applications. The insulating wrap where the main car generator leads are joined to the distribution lines must be protected against oil, and the starting battery cables,—as in the diesel locomotive,—have harmful acids to contend with. A half-lapped layer of No. 33 solves both problems.

In the regulator locker panel, individual control wires are taped into neat, trouble-free harnesses protected by a sheath of plastic tape. Pigtail splices used in wiring individual seat lights are given two or three wraps of No. 33, plus an extra length of tape over the pigtail to provide an extra measure of protection.

In the passenger car, as in the diesel, thin insulating material is important where splices must be made in small junction boxes. Railroad electricans frequently comment that by the time a half-inch coduit has been filled with wires, the junction box is too small to make the necessary splices. Using the 7-mil No. 33, however, they can lay the splices back into the box so there is no contact with the sides, consequently no abrasion.

In the cases described, either No. 33 or No. 22 tape is used as a sole insulation. Painting the insulation with varnish is eliminated, since the plastic tape forms a continuous, pinhole-free film. And since aging of an insulation is usually a chemical process, the chemically stable vinyl plastic backing of the tape should, and does, give long service.

EDITORIALS

Extending the Range Of Scientific Oil Testing

When highly scientific laboratory methods of testing lube oil and relating the results of the test to repair work required were first begun on a limited scale, there were a substantial number of railroad men who were skeptical of the need or value of such work. Today the desirability of such work is pretty well accepted. That this type of test work is not done on more railroads is largely for reasons other than lack of faith in what a good lube-oil testing program can do.

A principal and entirely logical objection on the part of smaller roads to the installation of a spectrograph or other advanced laboratory equipment for testing oil is that neither the volume of work that the instrument would handle nor the expected potential savings it would make are sufficient to justify the investment.

Larger railroads, speaking primarily from the standpoint of mileage, sometimes feel that no matter where they might locate a laboratory it would be too far from one or more of the road's scattered terminal points; consequently, the sample would take so long to reach the laboratory that little benefit would result from the test. The sample of oil that would show a defective bearing might, for example, take so long to reach the test point that the crankshaft would be destroyed while the oil was in transit.

Both of these objections could be eliminated by a simple system of joint laboratories at strategic points throughout the country, such as Chicago, Pittsburgh, Washington, Atlanta, St. Louis, Twin Cities and Omaha, to mention some of the largest. The operation could be handled in any number of ways. All the roads using an individual laboratory could jointly share the cost, or every road that contemplated using the services of such an arrangement could join in forming a small company to run the system on an equitable basis for all.

An arrangement of this nature will eliminate the need for small roads making expenditures for equipment that would be in service but a few hours a month. It would eliminate the problem of manning such equipment, and instead would give to the small roads the services of qualified experts who would be working continually, and therefore gaining wide experience, on the problem of lube oil testing and how it can save money on diesel maintenance.

Comparable benefits would accrue to large roads serving vast territories. The time lag between taking a sample and its analysis would be greatly reduced. The joint laboratory could serve to bring together and interchange new thoughts advanced by men from several roads. The best brains in the field could be hired at small cost to any one road. Extensive equipment could be furnished at low pro rata cost, and such equipment would be useful for further developing the science of lube oil testing, and for other fields as well. It could lead to the discovery of how to use economically a diesel fuel of much lower specifications and price than that thought necessary today, which alone would save the railroads far more than the cost of the entire group of laboratories.

Progressive Light Repairs

Some exceptionally pertinent discussion of the advantages of progressive repairs, as compared with spot-system light repairs for freight cars, developed at the April 7 meeting of the Northwest Carmen's Association, St. Paul, Minn., the principal points emphasized being: (1) the necessity for advance planning of the work and provision of necessary tools; (2) pre-selection and line-up of cars in accordance with repairs needed; (3) adequate supervision to catch delays before they become serious and reassign necessary materials or added labor so the entire track movement will not be held up by a single car.

One car foreman started the discussion and argument with the bald statement that he prefers to have cars placed on the repair track at night and stay there until the whole track is repaired. The reason behind this expression by a competent and experienced car supervisor is evidently that freight cars come to the repair track in every conceivable condition, from a few minor defects to broken sills and other serious and extensive damage. Added complications are that the full extent of the repair job is not always evident on first inspection; some cars are loaded and must be given preference over all others regardless of condition.

These difficulties can be met to a certain extent by classifying cars before they are placed on the repair track and one suggestion advanced was that cars be segregated on one track assigned to loads, one to cars needing quite heavy repairs and one or more tracks, as required, to the average run of light-repair work. An advocate of what has come to be generally accepted as the most economical method of giving cars either light or heavy repairs said: "We must not overlook the fact that the biggest gain in repairing light repair cars on progressive tracks is that it almost eliminates the heavy lifting and moving of jacks, horses and heavy equipment and machinery from one place to another, and that kind of work, as performed under the spot system, is entirely non-productive. With the progressive system, we move cars to where the tools and equipment are and not tools and equipment to the cars. I will agree that it is a little easier for the supervisor with the old spot system, but other than that I don't agree."

Special emphasis was placed on the need for adequate tools, most of which are well known on repair tracks. One supervisor, for example, referred to a car puller which he said is really something to see and pulls eleven loads.

Another mentioned fork-lift trucks for moving couplers, wheels, scrap, snow and many other things and said, "We have this type of truck in about 15 places and I believe we could use another one."

One thought expressed by this group of car men and in fact all others working in northern climates is the necessity of doing car repair work of all kinds insofar as possible with some protection from the elements. One supervisor said, "I have been on the repair track and worked when it was 30 degrees below zero and you certainly can't accomplish much when you have to spend half your time trying to keep warm."

As unused steam locomotive shop buildings become available, or new shops can be constructed, a number of progressive roads are equipping them with cranes and other facilities to speed up light car-repair work, reduce costs and meet the competition of other industries which lure away qualified railroad car men and inspectors dissatisfied with their working conditions.

Do Railroad Shops Really Compete?

A railroad shop man, after visiting a number of railroad-operated diesel electrical repair shops, was disappointed with what he found. He said that no one seemed to be cost conscious and that, in his opinion, the majority of the shops should not even exist. Manufacturers' repair shops please note.

His criticism is, in many cases, justifiable, but there are also many good reasons for things being as they are. Every railroad that operates locomotives must have some kind of a shop. When you have a shop, you have overhead, and when you have overhead, you must do some work to justify it. In the process of developing the work, you may have to increase the overhead, and then the question immediately arises, "How far shall I go?"

According to a fairly well accepted theory, the railroad shop should be able to take care of minimum maintenance work, the balance of the work being sent to outside repair shops. In this way, the railroad can maintain a good work load factor and, at the same time, be able to cope with emergencies and also have a means of checking the cost and quality of work done outside. The outside service shop is supposed to be able to maintain a good load factor by serving a number of railroads and perhaps other organizations, needing similar service.

The basic difficulty is that the diesel has come into railroad service so fast. No one has known just what to do, and it has been logical to try to develop methods based on steam locomotive shop experience.

Few experienced electrical men were available. A few have been acquired and many more are being developed. Some of these are young men taken from other industries and even from the farm, who must learn from the ground up. Many came from other branches of railroad service, and the work is frequently more difficult for them because they have much to unlearn.

In the process of developing shops and methods, many new things are being tried. These practices vary widely since shop electrical foremen have insufficient opportunity to learn what the other fellow is doing. Also, there is always the pride one feels in developing something new and better, especially if it is one's own idea.

This procedure generally is necessary. No good shop is ever finished, but the time is here when more attention need be paid to costs and efficiency. Procedures need organization and should be subjected to critical cost accounting if the railroads are to justify the existence of anything more than service shops.

NEW BOOKS

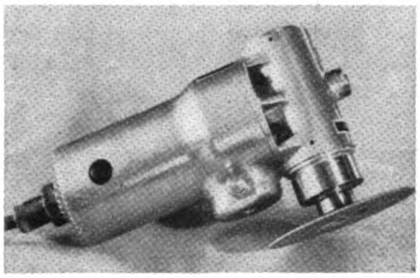
HEATING, VENTILATING AND AIR CONDITIONING GUIDE. *1952 Edition. Published by the American Society of Heating and Ventilating Engineers, 62 Worth street, New York 13. 1,496 pages; Price, $7.50.*

This is the annual revision of the Guide of the American Society of Heating and Ventilating Engineers and, like its predecessors, comprises one of the most complete volumes of its kind published. The technical data section of the current edition comprises 1,064 pages of technical and design information on 50 different subjects. Particular attention is called to the fact that 17 of the 50 chapters in the Guide have been the subject of extensive revision and improvement. While this Guide is primarily of value to those in the building and industrial heating, ventilating and air conditioning field, its basic information is of real value to those who have to deal with the heating and ventilation of shop buildings as well as those concerned with similar problems of air conditioning in railroad passenger cars.

WATER TREATMENT. *By Eskel Nordell. Published by the Reinhold Publishing Corporation, 330 West Forty-second street, New York. 525 pages, 6 in. by 9¼ in. Price $10.00.*

Water treatment to some mechanical department men who are in contact with locomotive operation is to take a cake of this or five or ten pounds of that and throw it into the tank cistern of a steam locomotive or the water supply tanks of a diesel. Most of them appreciate, however, that behind the practical operation is a world of exact chemical science. Mr. Nordell's book is one of those complete analyses of the whole question of water, its supply and its treatment that is done in such a thorough manner that it should open up new fields of interest to the user of treated water and serve as a practical handbook and guide to those who are concerned with the fundamentals of water treatment. This book deals with the impurities in water and the methods of treating them for a great variety of uses. The material is simply and clearly presented to show the basic principles involved and the solution to specific problems. Extensive tables and conversion factors, equivalents and other valuable tabular data make this one of the most complete books on the subject ever published. Two chapters alone out of 18—those on boiler feedwaters and cooling waters—are of particular interest to the operators of both steam and diesel-electric locomotives. The entire book should be of exceptional interest to those mechanical department men who wish to pursue the subject further.

NEW DEVICES



High-Speed Disk Grinder

A high-speed disk grinder designed for one-hand operation, has been introduced by the Balmar Corp., Baltimore, Md., a subsidiary of Franklin Railway Supply Company, New York 17, for use by railroads and railway equipment manufacturers. Called the Diskette, the tool is designed to withstand continuous duty, and polishes, grinds, sharpens and shapes all types of metals.

Its speed of approximately 8,000 r.p.m. enables this 9-in. long industrial tool to be used for a variety of finishing and polishing operations. Because of its light weight of only 4½ lb., it can be operated in close quarters.

Applications in the railway field also include removal of hard carbon from diesel engine pistons and cylinder heads, cleaning outside of cylinder liners, cleaning armature slots in generators and traction motors, removal of paint and rust, grinding down sharp edges of sawed metal parts and sharpening frequently used tools. Special attachments enable it to be used for hole drilling, hole polishing, rotary filing and cutting, solder cutting and even as a small bench grinder.

With its universal motor of 110 volts a.c. or d.c., housed in an aluminum alloy casting, the device is furnished with three composition disks, 4-in. in diameter and 3/32-in. thick of No. 36, 80 and 120 grit as well as a screw driver and a 3/16-in. wrench.

◆

Hot Chemical Jet Cleaner

A cleaning unit known as the Chemo Jet, and able to throw a solid stream of hot chemical and provide a separate high impact jet of water, has been announced by the Sellers Injector Corp., Philadelphia 30, Pa.

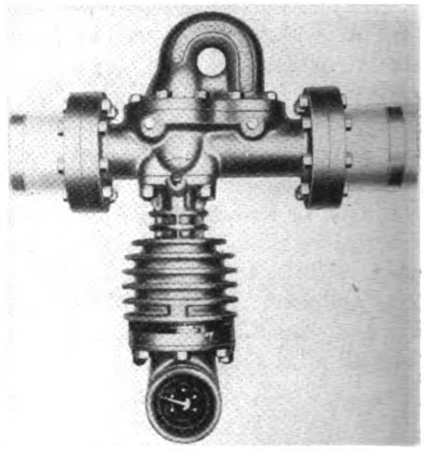
This cleaner handles all requirements of the two-step cleaning procedure needed to remove smokehouse deposits, paint, etc. For the chemical step, it provides a 150 gal. per hr. jet of undiluted detergent or solvent depositing a film of liquid on surfaces over 20 ft. away.

Another hose and nozzle assembly enables this unit to shoot a high impact jet of water effective at distances up to 35 ft. All heating and propelling is done within the unit by ordinary plant steam, withaut heaters, pumps or any moving parts.

These cleaners are available for wall-mounting, or as portable units with 50 gal. detergent tank.

◆

Steam Meter



A redesigned model SMKS Shuntflo meter for the measurement of steam, air or gas has been announced by Builders-Providence, Inc., Providence, R.I.

This meter, according to the manufacturer, has a streamlined damping chamber to facilitate cooling. Its Meehanite body allows greater strength and durability. It is said to have a simplified rotor mechanism for more efficient operation and easier replacement of parts. It has a strengthened roto shaft to withstand slugs of undue condensate in the line or sudden fluctuations in line pressure.

The device can be utilized by district heating companies and in industry for departmental heating and process work.

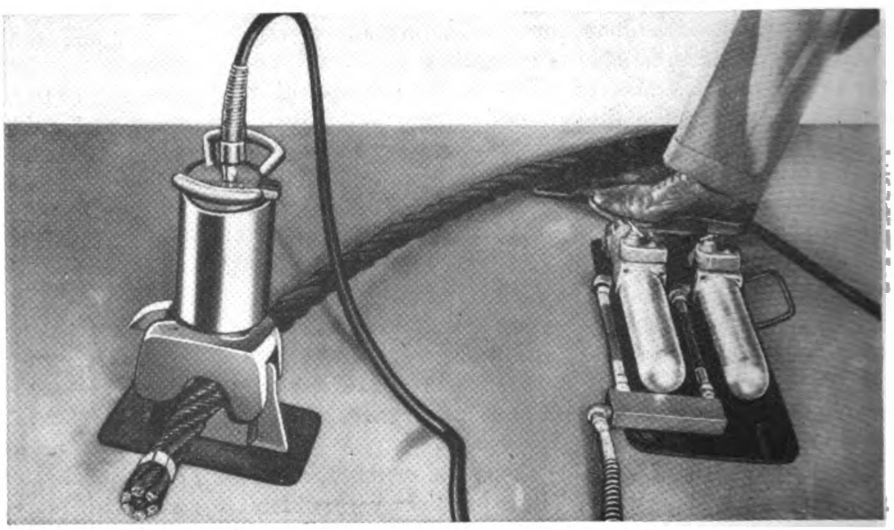
Large Diameter Wire Cutter

A latch-type design wire rope cutter has been developed by the Manco Mfg. Co., Bradley, Ill., to supplement their Guillotine line of metal cutting equipment.

This series 15 Guillotine is simple to operate. A click of the latch opens the anvil; material to be cut is laid in position, the main body of tool is raised back to vertical position which automatically locks the tool in the cutting position. Cutting time as little as 7 sec. can be obtained, depending on pump assembly used.

The cutter exerts up to 50 tons thrust and can cut wire rope up to 1¾ in. diameter. Its heavy duty shear-type blades are easily removable for resharpening when needed. The basic cutting unit is available with a variety of electric and air-hydraulic pump assemblies, including foot lever and remote control operations. Weight, 75 lb.

(New Devices continued on page 106)



Old and charge only for rebuilding the latter

TO PUT it plainly, this Unit Exchange Service of Electro-Motive is something no user of General Motors locomotives can afford to be without.

We suggest you check this statement with the many cost-conscious railroads who are now using the plan, and you'll know what we mean.

Briefly, here's how Unit Exchange works:

Immediately on receipt of your order, we ship you a fully rebuilt, fully guaranteed traction motor, engine, generator, blower or other exchange assembly. In most cases it can be delivered in your shop within 24 hours!

You return your old assembly for rebuilding, and when the rebuilding is completed, this unit goes back in our pool ready for shipment. You are charged only for the work and materials needed to bring your old assembly up to the same top-standard condition as the unit you received.

With Unit Exchange, you lose no time waiting for General Motors locomotive assemblies to be rebuilt. Thus, your investment in spares can be greatly reduced.

This factory rebuilding of major components—this Unit Exchange Policy—is another of the many *plus* services railroads have learned to expect from Electro-Motive. It's an essential part of a Lifelong Service Program that helps keep General Motors locomotives on the go for life.

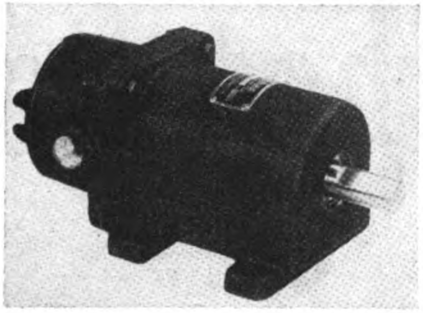
GENERAL MOTORS LOCOMOTIVES

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS
La Grange, Illinois • Home of the Diesel Locomotive

In Canada: GENERAL MOTORS DIESEL, LTD., London, Ontario

NEW DEVICES

(Continued from page 102)



Heavy Duty Tachometer Heads

Heavy duty tachometer heads, for measuring a wide range of speeds, are now available. These new series 56M units, when used with Metron Tachometer indicators, recorders, or controls can be used for measuring speeds of cement mills and kilns, ball mills, metal working machines, rubber extruders and similar installations. Speeds between 200 and 10,000 r.p.m. for full scale indication are measured by these heads, and they can be overspeeded 2 to 10 times with no damage resulting. They are manufactured by Metron Instrument Co., Denver 9, Colo.

The stainless steel head shaft is ¾ in. in diameter and supported in sealed ball bearings. The head casting is anodized aluminum having a ⅜ in. all. Electrical connections between the head and speed indicator can be up to 1000 feet or more and provisions are made for employing conduit or armored cable. Connections to the head can be made from any of four approaches and the head can be mounted in any position.

Stable performance, according to the manufacturer, is assured over a wide range of temperature, humidity, vibration or magnetic fields. Permanent lubrication for an extreme temperature range is employed throughout.

◆

Extension Rule

A new addition to the line of Lufkin "Red End" rules has been introduced by the Lufkin Rule Co., Saginaw, Mich. It is designated the model X-46F.

Numbering begins at the extension end of the rule, both sides, for flat reading or for regular measurements. The brass extension slide allows inside measurements up to 78 in. A stop prevents the brass slide from coming out.

It is constructed of sections of hardwood. The boxwood finish is protected by a clear plastic coat. Its large bold figures are easy-to-read against the light background. The brass end caps are flush inlaid and riveted. Both edges of both sides of the rule are graduated. The rule is marked consecutive inches to 16ths. Folded length is 8 in.

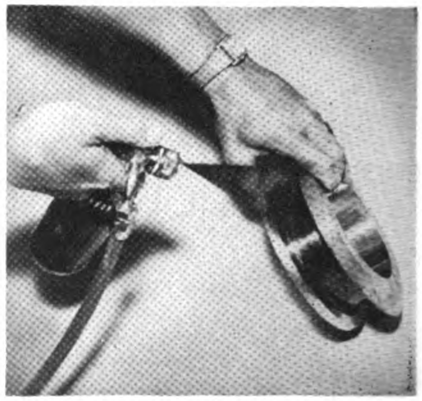
Dye Penetrant Inspection Process

Development of a dye penetrant inspection process, formulated to serve production-line inspection has been announced by Turco Products, Inc., Los Angeles 1, Calif.

The non-flammable product is called Turco Chek-Spek. Use of this non-toxic solution permits accurate evaluation of parts.

When used in conjunction with a vapor degreaser, the solution requires only two materials—Chek-Spek penetrant (flash point 140 deg. F.) and Chek-Spek developer (flash point 180 deg. F.). Following pre-cleaning by the vapor degreaser, the red penetrant is applied to those parts being inspected. After being allowed to dwell sufficiently long for it to enter the smallest defect, the surface dye is removed by suspending the parts for a few seconds in a vapor degreaser.

Following dye removal, the white developer is sprayed onto the parts being inspected. Strong developer capillary attraction pulls out the dye which has remained trapped in existing flaws. As the white developer dries, the red dye bleeds into it, locating and defining the extent of existing flaws.



The solution is applicable to both ferrous and non-ferrous metals. It can be sprayed or applied by dip or brush.

Metallograph Studies Metal Behavior

Offering both phase contrast and polarized light, this new metallograph can be used by laboratories for the study of anisotropic metals, identification of non-metallic inclusions where polarized light is required, examining unetched specimens or determining differences in level of areas within a specimen.

This desk-type metallograph, model 2400P, has been announced by the American Optical Co., Instrument Division, Buffalo 15, N.Y.

A quadruple revolving nosepiece permits rapid change of objectives. It has an automatic, motor-driven arc lamp which can be adjusted easily and accurately. A separate, built-in illuminator is used for visual examination and four photographic eyepieces operate in a quick-change slide.

A coated reflector is used in the vertical illuminator, yielding plane polarized light free of disturbing elliptical polarization. A slot receives compensators and phase annular diaphragms. Full and quarter wave compensators are standard, making possible striking color differences to accentuate slight differences in contrast.

The device is built into a convenient desk with ample space for storage and taking notes. It is supplied with an adjustable chair, finished in chrome and plastic-covered upholstery.

◆

Antiseptic Creams

A line of antiseptic protective creams has been introduced to industry by the West Disinfecting Co., Long Island City 1, New York. Containing Hexachlorophene, these creams provide a zone of inhibitation against Staphylococcus aureus and are so formulated as to be almost neutral in pH, thus assuring against irritations from free acids or alkalis.

The creams, packed in 12 oz. tubes for sanitary handling are: #211, an oil resistant, water soluble bland vanishing cream for protection against dust-borne irritants, viscous oils, dirts, greases and grimes; #311, a water-resistant soft cold cream for protection against dilute acids and alkalis; and #411, a solvent-resistant water soluble bland vanishing cream for protection against organic solvents, acetates and cooling and cutting oils of low water content.

In conjunction with the antiseptic, West has designed the Liquicreme Dispenser. Manufactured of polystyrene, the dispenser is designed to dispense a pre-determined amount of protective cream with each stroke of the lever. This unit contains an inner collapsable polyethylene bag which affords protection for the cream.

(New Devices continued on page 122)

NEWS

Corrosion Laboratory Expanded

At a recent conference of editorial representatives of the technical and business press the new facilities recently added to its marine corrosion testing station at Harbor Island near Wrightsville Beach, N. C., were shown by the International Nickel Company. The station provides facilities for the exposure of specimens to attack by sea water under natural conditions, including the erosive effects due to velocity of water through condenser tubes, piping systems, and on pump impellers, propellers, and other parts moving at fast rates through sea water. It also includes studies of the characteristics of materials affecting fouling by marine organisms.

An additional building provides space for a full-size salt-water evaporator and distillation unit, and its accompanying boiler capacity, required to study the effects of water treatment and design on the scaling of such units. It also has a meeting hall with a seating capacity for 72, a machine shop, and office. At Kure Beach, about 15 miles from Harbor Island, a new sea-spray test lot has been set up about 80 ft. from the shore, providing about three times the capacity of the former sea-spray test facilities.

The laboratory at Harbor Island and the marine atmosphere panels at Kure Beach, maintained by the International Nickel Company but utilized by many other producers and users of material, aside from their direct application to sea water and sea atmosphere exposures, have been instrumental in advancing the knowledge of corrosion mechanisms generally and have been productive of information applicable to the alleviation of industrial corrosion problems generally.

The International Nickel Company's marine-corrosion test station at Harbor Island, N. C., commonly known as the Sea Horse Institute

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE MAY ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horse-power*	*Service*	*Builder*
Gulf, Mobile & Ohio	2[1]	1,600	Road switch	Alco-G. E.
Louisville & Nashville	2A[2]	1,600	Freight	Alco-G. E.
	7B[2]	1,600	Freight	Alco-G. E.
	12[2]	1,600	Road switch	Alco-G. E.
	16[2]	1,000	Yard switch	Alco-G. E.
	15[2]	1,500	General purpose	Electro-Motive
	3[2]	1,200	Yard switch	Electro-Motive
Norfolk Southern	5[3]	1,600	Freight	Baldwin-Lima-Hamilton
Utah Railway	3[4]	1,600	Road switch	Alco-G. E.

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Delaware, Lackawanna & Western	100	70-ton covered hoppers	American Car & Fdry.
Fruit Growers Express Company	500[5]	50-ton refrigerator	Pacific Car & Fdry.
Norfolk & Western	500[6]	50-ton box	Pullman-Standard
Seaboard Air Line	400[7]	50-ton gondola	Company shops

PASSENGER-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Chicago, Burlington & Quincy	10	Gallery type suburban coaches	Budd Co.
Ontario Northland	3[8]	Baggage	National Steel Car

[1] Delivery scheduled for August.
[2] Scheduled for delivery during last quarter of this year.
[3] Delivery scheduled to begin late this summer. The locomotives will cost approximately $800,000.
[4] Scheduled for delivery during August and September. To cost approximately $215,000 each.
[5] For delivery beginning the third quarter of this year.
[6] For delivery during the last quarter of this year.
[7] These low-side gondolas are being built on an assembly-line basis from prefabricated parts and are entirely new except for the trucks which have been taken from retired gondola cars. Estimated cost, $1,319,000.
[8] Estimated cost, $240,000. Delivery expected early next year.

NOTES:

Chicago, Burlington & Quincy.—The board of directors of the Burlington has authorized purchase of six 2,250-hp. diesel-electric passenger locomotive units for suburban service. When these units are delivered, the Burlington's Chicago suburban service will be fully dieselized. The board also authorized purchase of 21 road-switching locomotives. These dual-purpose units will cost over $4,000,000 and will be used on both main and branch lines and in yard service.

Nashville, Chattanooga & St. Louis.—The board of directors of the N.C.&S.L. has approved the purchase of three G. P.-7 locomotives from the Electro-Motive Division of General Motors at an estimated cost of $150,000 each.

David E. Smucker Heads D.T.A. Railroad Division

David E. Smucker, assistant chief engineer of the Pennsylvania, has been appointed director of the Defense Transport Administration's Railroad Transport Division. He succeeds Elmer J. Stubbs, who resigned April 15 to return to his former position as assistant vice-president of the Erie.

N. of M. Creates Special Equipment Department

To supervise repair and reconstruction of equipment, with a view to obtaining maximum use of it, the National of Mexico has announced creation of a special tech-

nical department of motive power and machinery.

Functions of the new department, it is reported, will be: (1) study and appraise probable future demand for railroad transportation in Mexico; (2) study and appraise depreciation of locomotives and other rolling stock; (3) establish a program for acquisition and repair of equipment; and (4) determine the quantity of material needed annually for an adequate repair program. In carrying out these functions, the department also will be charged with working out plans for use of more efficient methods both in repair of existing equipment and acquisition of new equipment.

Three Railroad Sessions at A.S.M.E. Spring Meeting

THREE Railroad sessions are scheduled during the semiannual meeting of the American Society of Mechanical Engineers to be held at the Hotel Sheraton-Gibson, Cincinnati, June 15 to 19, inclusive. The program for these sessions is as follows:

TUESDAY, JUNE 17
2:30 P.M.
RAILROAD I

A Method of Establishing and Comparing Tonnage Ratings of Diesel Locomotives, by E. H. Weston, assistant chief mechanical engineer, Chicago & North Western.

WEDNESDAY, JUNE 18
9:30 A.M.
RAILROAD II

Effect of Impact on Freight Operation Loss and Damage, by W. A. Murphy, freight claim agent, New York, Chicago & St. Louis.

Development in Metallic Friction Draft Gears, by N. T. Olsen, vice-president, Peerless Equipment Company.

Developments in Rubber Draft Gears, by A. M. Bixby, vice-president, Waugh Equipment Co.

2:30 P.M.
RAILROAD III

Developments in Cushioned Underframes, by W. K. Durbon, vice-president, Hulson Co.

Dynamic Testing of Freight Cars, by J. M. Roehm, Pullman-Standard Car Manufacturing Co.

Miscellaneous Publications

RECOMMENDED PRACTICES FOR THE WELDING OF STEEL CASTINGS. Published by Steel Founders' Society of America, Cleveland, Ohio. 40 pages. Price 35 cents. Obtainable also through the Tempil Corporation, 11 West 25th street, New York, without charge to engineers and technicians requesting it on business letterhead. A reference manual for those responsible for the production or, or the repair welding of steel castings. Makes available details of the special operational techniques needed for those steels not as readily weldable as others. Practices outlined as adaptable to the fabricator as to the steel foundryman. Welding Methods, Electrodes, and Recommended Welding Procedure for Carbon-Steel and Low-Alloy Steel Castings each dealt with in a separate section.

SUMMARY OF MONTHLY HOT BOX REPORTS

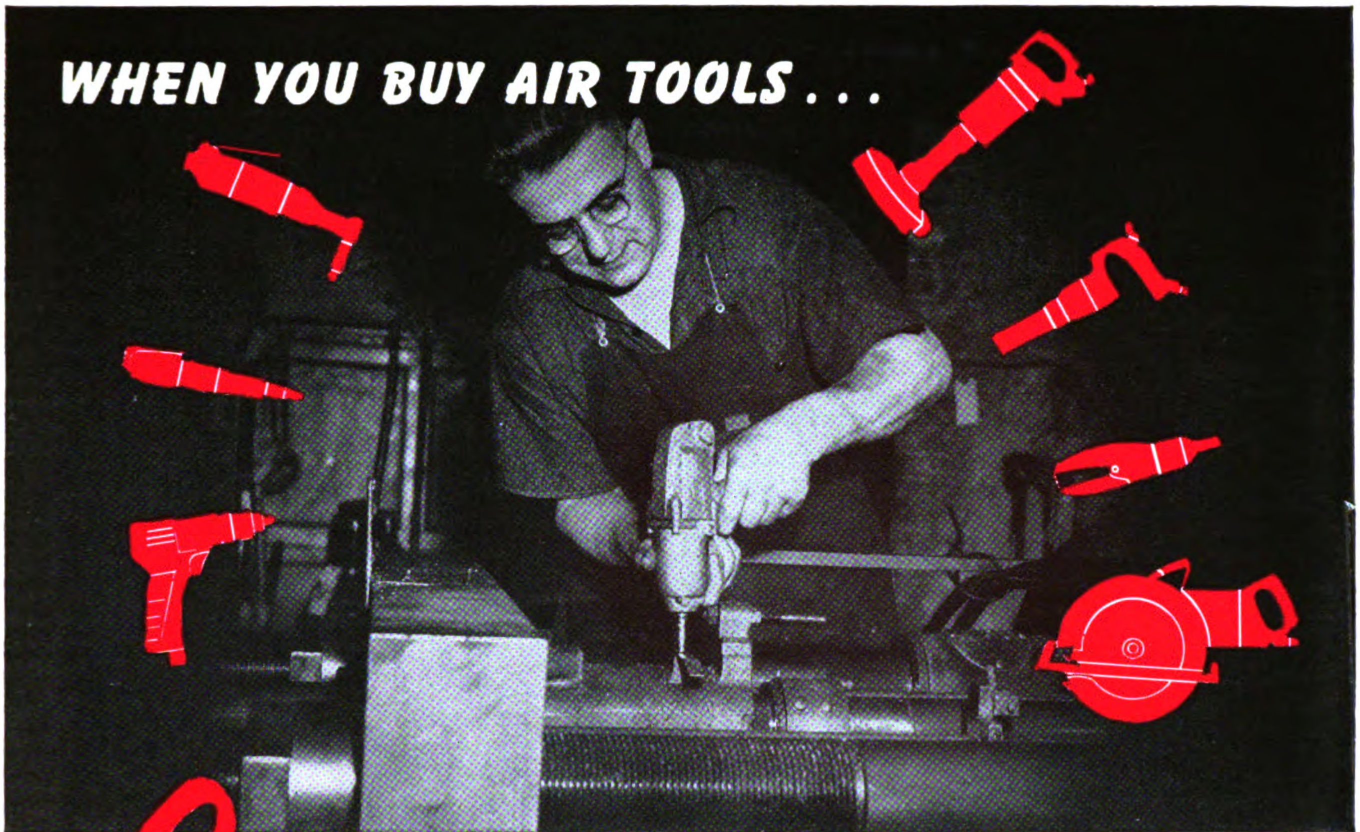
Month	Foreign and system freight car mileage (total)	Cars set off between division terminals account hot boxes: System	Foreign	Total	Miles per hot box car set off between division terminals
July, 1950	2,745,932,894	.....	.....	23,957	114,619
August, 1950	2,937,455,020	7,422	15,490	22,912	128,206
September, 1950	2,974,297,739	6,541	12,881	19,422	153,141
October, 1950	3,165,997,915	4,343	8,935	13,278	238,439
November, 1950	2,868,871,913	2,536	5,331	7,867	364,672
December, 1950	2,813,042,212	2,278	5,968	8,246	341,140
January, 1951	2,840,847,511	2,870	8,436	11,306	251,269
February, 1951	2,425,226,454	4,528	14,063	18,591	130,452
March, 1951	3,063,173,942	3,667	10,078	13,745	222,857
April, 1951	2,996,562,763	3,702	8,914	12,616	237,521
May, 1951	3,013,634,782	5,631	13,737	19,368	155,599
June, 1951	2,874,873,495	7,074	15,376	22,450	128,057
July, 1951	2,768,920,095	8,886	18,823	27,709	99,929
August, 1951	3,009,371,111	9,023	19,092	28,115	107,038
September, 1951	2,925,570,545	6,472	13,565	20,037	146,008
October, 1951	3,116,490,095	4,131	9,053	13,184	236,384
November, 1951	2,939,503,144	2,022	4,405	6,427	457,368
December, 1951	2,752,316,133	2,130	5,398	7,528	365,611
January, 1952	2,824,298,630	3,208	7,197	10,405	271,437

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-21V AND M-240)

Item No.		Month of January 1952	1951
3	Road locomotive miles (000) (M-211):		
3-05	Total, steam	20,680	28,876
3-06	Total, Diesel-electric	25,655	20,921
3-07	Total, electric	802	838
3-04	Total, locomotive-miles	47,168	50,635
4	Car-miles (000,000) (M-211):		
4-03	Loaded, total	1,647	1,749
4-06	Empty, total	898	852
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):		
6-01	Total in coal-burning steam locomotive trains	37,286	48,862
6-02	Total in oil-burning steam locomotive trains	8,450	11,728
6-03	Total in Diesel-electric locomotive trains	69,369	57,675
6-04	Total in electric locomotive trains	2,135	2,275
6-06	Total in all trains	117,249	120,546
10	Averages per train-mile (excluding light trains) (M-211):		
10-01	Locomotive-miles (principal and helper)	1.04	1.05
10-02	Loaded freight car-miles	38.50	38.50
10-03	Empty freight car-miles	21.00	18.80
10-04	Total freight car-miles (excluding caboose)	59.50	57.30
10-05	Gross ton-miles (excluding locomotive and tender)	2,744	2,653
10-06	Net ton-miles	300	299
12	Net ton-miles per loaded car-mile (M-211)	33.20	32.30
13	Car-mile ratios (M-211):		
13-03	Per cent loaded of total freight car-miles	64.70	67.20
14	Averages per train hour (M-211):		
14-01	Train miles	17.10	16.60
14-02	Gross ton-miles (excluding locomotive and tender)	46,273	43,471
14	Car-miles per freight car day (M-240):		
14-01	Serviceable	44.30	45.50
14-02	All	42.20	43.40
15	Average net ton-miles per freight car-day (000) (M-240)	907	942
17	Per cent of home cars of total freight cars on the line (M-240)	40.40	34.50
	PASSENGER SERVICE (DATA FROM I.C.C. M-213)		
3	Road motive-power miles (000):		
3-05	Steam	8,753	12,584
3-06	Diesel-electric	18,166	16,001
3-07	Electric	1,720	1,715
3-04	Total	28,639	30,300
4	Passenger-train car-miles (000):		
4-08	Total in all locomotive-propelled trains	282,809	292,751
4-09	Total in coal-burning steam locomotive trains	46,743	67,727
4-10	Total in oil-burning steam locomotive trains	27,571	37,565
4-11	Total in Diesel-electric locomotive trains	189,612	169,210
12	Total car-miles per train-miles	9.74	9.58
	YARD SERVICE (DATA FROM I.C.C. M-215)		
1	Freight yard switching locomotive-hours (000):		
1-01	Steam, coal-burning	1,020	1,444
1-02	Steam, oil-burning	174	259
1-03	Diesel-electric[1]	23	26
1-06	Total	4,444	4,691
2	Passenger yard switching hours (000):		
2-01	Steam, coal-burning	38	58
2-02	Steam, oil-burning	13	15
2-03	Diesel-electric[1]	265	246
2-06	Total	350	354
3	Hours per yard locomotive-day:		
3-01	Steam	7.30	8.50
3-02	Diesel-electric	17.10	18.20
3-05	Serviceable	14.60	14.90
3-06	All locomotives (serviceable, unserviceable and stored)	12.60	12.90
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.87	1.85
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.77	0.75

[1] Excludes B and trailing A units.



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SUPPLY TRADE NOTES

American Hoist & Derrick Co.—The American Hoist & Derrick Co. has moved its New York district office from 50 Church street, New York, to the foot of Jacobus avenue, South Kearny, N. J.

◆

Gould-National Batteries, Inc.—The Industrial division of Gould-National Batteries, Inc., Trenton, N. J., has reorganized its sales forces in eastern, midwestern and Pacific territories. The move involves creation of regional managerships in Pittsburgh and Detroit, appointment of a coordinator of sales and a manager of headquarters sales, and promotion and reassignment of several field sales executives. *F. A. Miller*, former New York regional sales manager, has been appointed coordinator of sales at the Trenton headquarters, and *Frank Keenan*, of the headquarters sales staff, has been promoted to its managership. Pittsburgh and Detroit territories, hitherto administered by the Cleveland regional office, have become bases for regional sales offices. *O. W. Rider*, former Cleveland district manager, is regional manager at Pittsburgh, and *John P. Kelly*, Philadelphia representative, will manage the Detroit regional office. *Malcolm Janis*, New York representative specializing in telephone, alarm system and control type batteries, has been appointed New York regional manager. *Stanley J. Mahurin*, Denver area representative, has been appointed San Francisco district manager.

◆

H. K. Porter Company, American-Fort Pitt Spring Division.—The *Sneed Sales Company* has been appointed exclusive sales representative in the southwest for the American-Fort Pitt Spring Division. Sneed Sales, which will service accounts in Texas, Oklahoma, Arkansas and New Mexico, is located at 401 North Haskell avenue, Dallas 1, Tex.

◆

American Locomotive Company.—A new sales office has been opened at 219 East Broad street, Richmond, Va., for the *Railway Steel Spring Division* of Alco. *E. J. Brown* is in charge of the new office as assistant to Vice-President *W. A. Callison*. For the past five years Mr. Brown had been assigned to the Cleveland office of the American Locomotive Company, where he is being succeeded by *W. J. Horstmann*. Mr. Horstmann for the past three years had been assigned to Railway Steel Spring Division sales in New York.

E. J. Brown

W. J. Horstmann, formerly with the Railway Steel Spring Division in New York, succeeds Mr. Brown at the Cleveland sales office.

Mr. Brown, who is in charge of the new Richmond, Va., sales office of the firm's railway steel spring division, became associated with the company in the Chicago sales office in 1935 and for the last five years has been assigned to the Cleveland, Ohio, office.

◆

American Steel Foundries.—*T. R. Sadler* has retired from the New York office sales department of American Steel Foundries after 47 years' service.

◆

Pittsburgh Screw & Bolt Corp.—*Alexander I. Stayman* has been elected vice-president sales.

Mr. Stayman who had been assistant to the president since May 1951 has been with the company for 17 years in the sales division and was manager of sales in the

Ideas for Diesel maintenance

BETTER BACKSHOP CLEANING?

Read how Pennsalt 45-X solved these 3 problems

If you are looking for a heavy-duty backshop cleaning compound . . . a cleaner especially designed for tough soil-removing operations, Pennsalt 45-X may be your answer. This concentrated, free-flowing, virtually anhydrous alkaline silicate-type cleaner has solved many a cleaning problem for some of the country's leading roads. Here are a few typical cases:

Example A

This mid-Western railroad had to clean filters of a tacky oil especially designed for impregnating filter cores. Of the two cleaning compounds already in use, one required 30 minutes for the job; the other failed completely. *Pennsalt 45-X* was tried at 5 oz./gal., 212°F., and cleaned all types sparkling bright *in 5 minutes*, eliminating a serious bottleneck.

Example B

In a new facility servicing 66 Diesel units, Pennsalt 45-X was chosen for use in an 800-gal. steam-heated cleaning tank. Over a 5-month observation period, the 45-X cleaned more than 700 major parts (heads, liners, pistons, gear cases) and hundreds of small parts—fast and efficiently. What's more, the 45-X method cost *less than half* the amount estimated for another process.

Example C

The problem here, as the illustration below suggests, is to clean cylinder liners "factory-clean" in minimum time, and get the locomotive back in service. This before-and-after picture is genuine proof of 45-X's cleaning power and efficiency.

Many more such examples are available in Pennsalt's files. But you are probably more interested in knowing how Pennsalt 45-X can help *your* maintenance cleaning operations. Your nearest Pennsalt service representative is thoroughly trained to help you . . . and equipped to set up tests to determine how Pennsalt Railroad Maintenance Cleaners may give you better, faster cleaning. Write: Maintenance Chemicals Dept., Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.

RAILROAD MAINTENANCE CLEANERS BY

Pennsalt Chemicals

PROGRESSIVE CHEMISTRY FOR OVER A CENTURY

Pittsburgh and Southeastern district. He was assistant to the vice-president and general sales manager prior to becoming assistant to the president.

◆

PULLMAN-STANDARD CAR MANUFACTURING COMPANY.—*Fred W. Alger*, assistant vice-president of the Pullman-Standard Car

F. W. Alger

Manufacturing Company, has been appointed to the Birmingham (Ala.) sales office, where he will be associated with the southern district sales vice-president.

◆

CANADIAN RAILWAY PRODUCTS COMPANY. —*Douglas J. Baillie*, formerly with the Canadian Appliance Company, has formed a new sales organization—the Canadian Railway Products Company—with offices in room 912, Dominion Square Building, Montreal. Mr. Baillie recently was appointed agent for W. H. Miner, Inc., of Chicago, to sell their products in Canada.

◆

HUCK MANUFACTURING COMPANY.—*Robert Looker*, of the sales department of the Huck Manufacturing Company, Detroit, has been appointed sales manager, while *Donald Stamy*, formerly an engineer with the Chrysler Corporation, has been appointed assistant sales manager.

◆

TIMKEN ROLLER BEARING COMPANY.—*John F. Byrom* has been appointed sales engineer railway division of the Timken Roller Bearing Company at Minneapolis. Mr. Byrom was formerly sales engineer, railway division at Chicago. All railway division activities both in Chicago and Minneapolis territories remain under supervision of *Paul N. Wilson*, district manager.

◆

MINNEAPOLIS - HONEYWELL REGULATOR COMPANY.—*John A. Robinson* has been appointed sales manager of the Eastern and Mid-Atlantic regions for the industrial division of the Minneapolis-Honeywell Regulator Company. *Joseph J. Matulis* has been appointed industrial manager for the Midwest region to succeed Mr. Robinson, and *C. G. Behnke*, industrial manager of the Chicago branch office.

◆

THERMO-KING RAILWAY CORPORATION.—The *United States Thermo Control Company* has announced formation of a subsidiary, the Thermo-King Railway Corporation, to handle railway sales of its au-

S. MacClurkan

tomatic car refrigerating systems. The subsidiary will have offices at 80 East Jackson boulevard, Chicago 4, under direction of *Samuel MacClurkan*, vice-president. Mr. MacClurkan was formerly manager of railway sales for the Pyle-National Company.

◆

BLACK & DECKER MFG. CO.—Five district sales managers for the United States and one for Canada have been appointed by the Black & Decker Mfg. Co. as follows: *E. M. Stuart* for the northeastern region; *A. Lee Proctor*, southeastern; *Raymond G. Horner*, central; *Wm. L. Poynter*, midwest; *Arthur S. Boehm*, Pacific coast, and *Donald S. McKeracher* for Canada. These men were formerly territory branch managers in Boston, Atlanta, Chicago, Kansas City, San Francisco and Montreal, respectively. They will report to the general sales manager at Towson, Md.

◆

MCKAY COMPANY.—*C. Louis Freeze* has been appointed district sales representative in Delaware, eastern Pennsylvania and southern New Jersey for the Electrode Division of the McKay Company.

◆

WALL COLMONOY CORPORATION—*Anthony J. Allen* has joined the Wall Colmonoy Corporation as eastern sales manager, with headquarters in New York. Mr. Allen will be in charge of sales on the Eastern Seaboard.

◆

WAUGH EQUIPMENT COMPANY.—*Arthur M. Bixby* formerly assistant to president of the Waugh Equipment Company has been elected vice-president of the company.

Mr. Bixby was a special mechanical apprentice with the New York, New Haven &

A. M. Bixby

Hartford in 1925-28 and subsequently worked in the test department; as assistant to mechanical engineer; and as mechanical assistant in the research department. He became associated with Waugh Equipment in 1939 as a service engineer.

◆

ALUMINUM COMPANY OF AMERICA.—*C. F. Nagel, Jr.*, chief metallurgist, has been elected a vice-president of Alcoa.

McDougall-Butler Company.—*Edward J. Butler* has been elected president of the McDougall-Butler Company to succeed his father the late *Andrew S. Butler*. *Herbert J. Miller*, executive vice-president, has been appointed also general manager. *H. Vernon Smith* has been appointed southern sales director and elected vice-president.

F. G. Penl

Frank G. Penl, sales manager of Transportation Finishes of the McDougall-Butler Company of Buffalo, N.Y., has been appointed sales manager. Mr. Penl will continue to assume the responsibilities of Transportation Finishes in addition to supervising all other sales activities of the company.

◆

International Nickel Company of Canada.—*Paul D. Merica*, executive vice-president and a director of the International Nickel Company of Canada, has been elected president to succeed *John F. Thompson*, who will continue as chairman of the Board and chief officer of the company. *J. R. Gordon*, assistant vice-president, has been appointed also assistant general manager, and in these capacities will manage all Canadian activities under the direction of *R. Leslie Beattie*, vice-president and general manager, whose headquarters are now at Toronto, Ont.

Mr. Merica has been elected also president of the *International Nickel Company*, United States subsidiary of International of Canada. Other executive changes in the U. S. subsidiary are: *Walter C. Kerrigan*, vice-president, has been elected to the newly created position of vice-president and general sales manager, responsible for both nickel and mill products sales, with *L. R. Larson*, elected assistant vice-president and assistant general sales manager. *Theodore H. Dauchy*, *Richard A. Cabell* and *John A. Marsh* have been named to assistant vice-presidents.

◆

Pyle-National Company.—*Charles H. Hobbs*, formerly district manager at St. Louis for the Pyle-National Company, has been appointed manager of railroad sales, with headquarters in Chicago. Mr. Hobbs succeeds *Samuel MacClurkan*, who has resigned. *Robert P. Underwood* has been transferred from the Chicago sales office to St. Louis; *Harland R. Benike*, temporarily engaged in special work in the headquarters sales office in Chicago, has returned to his former position as sales representative in St. Paul. *Robert R. Andersen*, who relieved Mr. Benike in St. Paul, has been transferred to Chicago, to handle special assignments.

C. H. Hobbs

◆

Gustin-Bacon Manufacturing Company.—The Gustin-Bacon Manufacturing Company has extended the distributing territory of the *Western Fiberglas Supply Company* of San Francisco to include the entire Pacific coast and Alaska. Western Fiberglas has opened new offices in Seattle, Wash., and will soon add branch offices in Spokane, Wash.; Portland, Ore., and in Alaska.

American Car & Foundry Co.—*Philip A. Hollar* has resigned as deputy under secretary of commerce for transportation and has returned to his position as vice-president of the American Car & Foundry Co.

Mr. Hollar served as a consultant to the Defense Transport Administration for several months prior to his appointment as deputy under secretary in April 1951. He has been with American Car & Foundry since 1946, and from 1942 to 1945 was with the Association of American Railroads.

◆

Westinghouse Air Brake Company.—*W. Lyle Richeson* has been elected vice-president of Westinghouse Air Brake. Mr. Richeson was formerly vice-president of the American Car & Foundry Co., New York.

Mr. Richeson completed three years in mechanical and electrical engineering at Tulane University and is a graduate (1924) of Sheffield Scientific School, Yale University where he received the degree of bachelor of science in administrative engineering. His business career has been devoted to the railroad supply field. He became associated with American Car & Foundry in 1925 and advanced in the sales organization by establishing the Cleveland office where he was successively district agent, representative and sales manager. Later he became manager of sales at New York, then assistant vice-president and vice-president in sales.

W. Lyle Richeson

◆

Clark Equipment Company.—*Vernor*

L. Johnson, associated until recently with the Studebaker Corporation, has been appointed regional sales manager of the Clark Equipment Company's northeastern region, with headquarters at 165 Broadway, New York.

◆

Union Carbide & Carbon Corp.—*Morse G. Dial* has been elected president of the Union Carbide & Carbon Corp., to succeed *Fred H. Haggerson*, who continues as chairman of the board; *Walter E. Remmers* as vice-president, alloys Division, Union Carbide & Carbon. Mr. Remmers, who joined Union Carbide in 1936, has been president of Electro Metallurgical Company since 1948, and president of the United States Vanadium Company since 1950, both divisions of Union Carbide & Carbon.

Kenneth I. Thompson has been appointed vice-president—sales of the *Oxweld Railroad Service Company*, a division of the Union Carbide & Carbon.

Mr. Thompson entered the industrial equipment business in 1921 with the Pennsylvania Pump & Compressor Co. and later worked for the Lehigh-Fuller Company. In 1937 he was associated with Ingersoll-Rand and in 1945 he joined Oxweld Railroad Service as eastern sales manager. Mr. Thompson was appointed general manager in 1950, with headquarters in Chicago.

◆

Jones & Lamson Machine Co.—A new, full-color sound 16-mm motion picture, "What's the Difference?" has been released by Jones & Lamson Machine Company, Dept. 710M, Springfield, Vt. The film, with a 21-min. running time, tells the full optical comparator inspection story—from "comparison" to "precision measurement" —with production line scenes taken in other plants under working conditions. Bookings for the loan of this movie can be made by schools, technical associations, manufacturers, quality control groups, etc.

◆

United States Steel Corporation.—*Benjamin F. Fairless*, president of the United States Steel Corporation, has been selected to receive the John Fritz Medal and Certificate as "Champion of the American Free Enterprise System for Notable Industrial Achievement in the Production of Steel." The medal is perpetuated by the A.S.C.E., A.I.M.M.E., A.S.M.E., and A.I.E.E. as a joint honor for scientific or industrial achievement in any field of pure or applied science.

The *United States Steel Company*, a subsidiary of the United States Steel Corporation, at Pittsburgh, has established a transportation department which will be responsible for coordinating transportation services to meet all plant requirements. *J. W. Hoover*, formerly general traffic manager, has been appointed general transportation manager, manufacturing division.

◆

Scullin Steel Company.—*T. H. Parke*, former assistant vice-president in charge of the New York office of the Scullin Steel Company, has been appointed vice-president.

◆

Aircraft-Marine Products, Inc.—Two new educational motion pictures which dramatically illustrate the uses, application, inspection and quality control of solderless

MORE IN PRODUCTION

For Less in DOLLARS

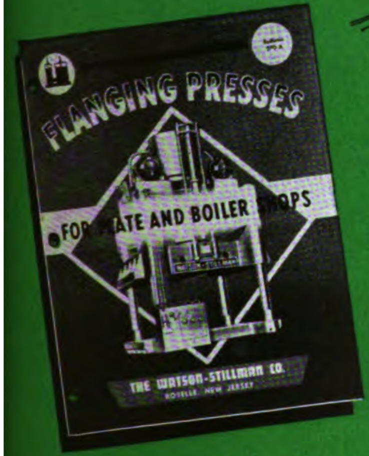
with

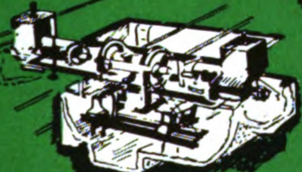
W-S CAR SHOP FLANGING PRESSES

Your current drive for production economy has two sides. You must produce what you *are* producing for *less;* or you must produce *more* without proportionately increasing your costs. Either of these objectives could be replaced by its alternative almost overnight . . . but with material and labor costs what they are, it's a cinch you'll be shooting hard at *one* of them for many years to come.

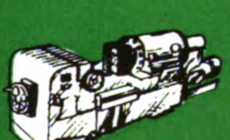
W-S Flanging Presses can help you save *either* way—on current production rates or on increased volume and advanced delivery deadlines. Furthermore, they're designed to give you that help for the many years of service which now, more than ever, you must expect of capital equipment.

Minutes and cents lost in the shop may pyramid into hours and dollars on the rails. Make your next new-plant investment *count*—see a W-S representative, or write direct for Bulletin 570-A, W-S Flanging Presses.



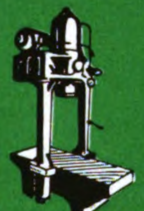


STRAIGHT-THROUGH WHEEL DEMOUNTING PRESS

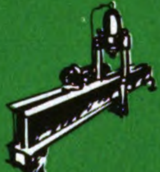


FROG AND SWITCH BENDERS

ARMATURE SHAFT ASSEMBLING AND DISASSEMBLING PRESS



BUSHING PRESS



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terminals for stranded or solid wire have just been produced by Aircraft-Marine Products, Inc., 2100 Paxton street, Harrisburg, Pa. These 16 mm sound films, in color, cover two different aspects of the solderless wire termination story. "All's Well That Ends Well" demonstrates the use and application of solderless terminals with precision hand tools. "By the Millions" shows how solderless terminals in continuous strips can be applied at speeds of up to 4,000 per hour in mass production with specially designed automatic machines. The films are intended primarily for instructional purposes, but will also be presented before trade association meetings, industrial groups, and engineering and technical schools.

◆

WESTINGHOUSE ELECTRIC CORPORATION.—*W. W. Sproul*, sales manager, industrial products, has been elected vice-president in charge of the company's general industrial products group of divisions which comprise the Micarta, standard control, small motor, elevator, Sturtevant, welding and lighting divisions, and the Bryant Electric Company. *L. B. McCully*, manager, in charge of East Pittsburgh divisions (transportation and generator, and switchgear), has been elected vice-president in charge of the same divisions. *H. E. Seim*, general manager of the Sturtevant division and the Bryant Electric Company, has been appointed vice-president in charge of the Sturtevant division at Boston.

◆

AMERICAN BRAKE SHOE COMPANY. — *Stephen S. Conway* has been appointed first vice-president of the *Brake Shoe and Castings Division* of American Brake Shoe.

S. S. Conway

Mr. Conway, who has been with American Brake Shoe since 1912, will continue also as vice-president in charge of sales for the Brake Shoe and Castings and Southern Wheel Divisions.

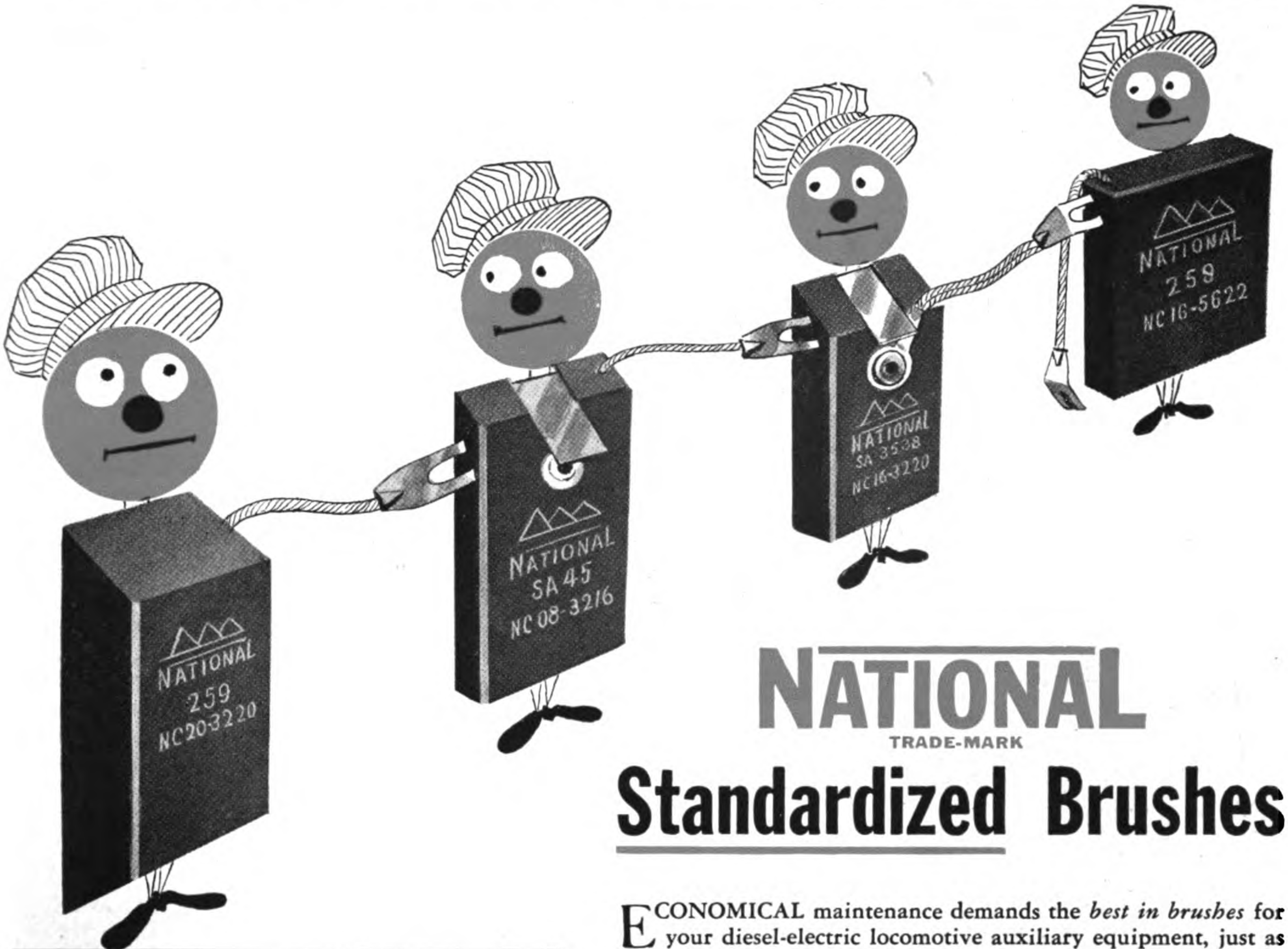
◆

REYNOLDS METALS COMPANY.—The Reynolds Metals Company has appointed the *Vinson Supply Company*, Dallas, Tex., and *Very's Brothers, Inc.*, Columbus, Ohio, as distributors handling Reynolds' general line of aluminum mill products.

◆

WORTHINGTON CORPORATION.—The Dunellen, N. J., plant of the Worthington Corporation, has been redesignated as the Plainfield Works, Plainfield, N. J.

"Right Dress" for Diesel-Electric AUXILIARY EQUIPMENT



NATIONAL

TRADE-MARK

Standardized Brushes

ECONOMICAL maintenance demands the *best in brushes* for your diesel-electric locomotive auxiliary equipment, just as it does for diesel-electric main generators and traction motors. That's why National Carbon has standardized all down the line . . . now offers you the full advantages of purchase from stock with its consequent uniform quality, low cost and quick delivery on the standardized auxiliary brushes listed below.

Like other "National" Carbon Brushes, STANDARDIZED auxiliary equipment brushes *cost less* – any way you look at it. *Uniform dependability* means lot-to-lot freedom from breakage, shunt-loosening or other brush failures. *Commutator maintenance* is reduced by service-proved grades. High electrical and mechanical *efficiency* contribute to operating economy. All together, they mean *longer brush life.*

"National" Standardized Brushes for D-E Locomotive Auxiliary Equipment

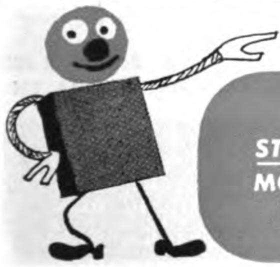
BRUSH NO.	SIZE	GRADE
NC 16-3220	1¾ x 1 x ½	SA-3538
NC 16-5622	1¾ x 1¾ x ½	259
NC 20-3220	2 x .993 x .618	259
NC 08-3216	1¾ x 1 x ¼	SA-45

DON'T FORGET . . . "NATIONAL" STANDARDIZED BRUSHES GIVE YOU A BETTER PRODUCT . . . IN A BETTER PACKAGE . . . AT A BETTER PRICE!

LOW LIGHT BILLS . . .

. . . mark phenomenal acceptance of the "EVEREADY" No. 1050 Industrial Flashlight Battery by a broad cross-section of industry. Delivering *twice the usable light* of any battery we've ever made before, it will not swell, stick, or jam in the flashlight . . . has no metal can to leak or corrode.

ADD THEM UP! THEY TOTAL THE FINEST BRUSH MONEY CAN BUY.



BUY NATIONAL STANDARDIZED BRUSHES FOR MOST EFFICIENT MOTOR AND GENERATOR OPERATION.

The terms "National", "Eveready", the Three Pyramids device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street, New York 17, N. Y.

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

In Canada: National Carbon Limited, Montreal, Toronto, Winnipeg

Obituary

Wallace B. Phillips, president of the Pyrene Manufacturing Company, Newark, N. J., died on April 14 at Roosevelt Hospital, New York. Mr. Phillips was born in New York on March 30, 1886. In 1912, he went to England as chairman and managing director of the Pyrene Company, Ltd., returned to the United States in 1950 to become executive head of the parent company.

Wallace B. Phillips

Clarence C. Rausch, assistant vice-president and manager of rust preventive sales for the Dearborn Chemical Company, Chicago, died on April 29 in Houston, Tex. Mr. Rausch had been with the firm for 32 years, serving as assistant vice-president since 1941 and manager of rust preventive sales since 1950.

PERSONAL MENTION

Canadian National

H. J. Betts, electrical engineer-equipment, Montreal, appointed electrical engineer, Central region, with headquarters at Toronto, Ont.

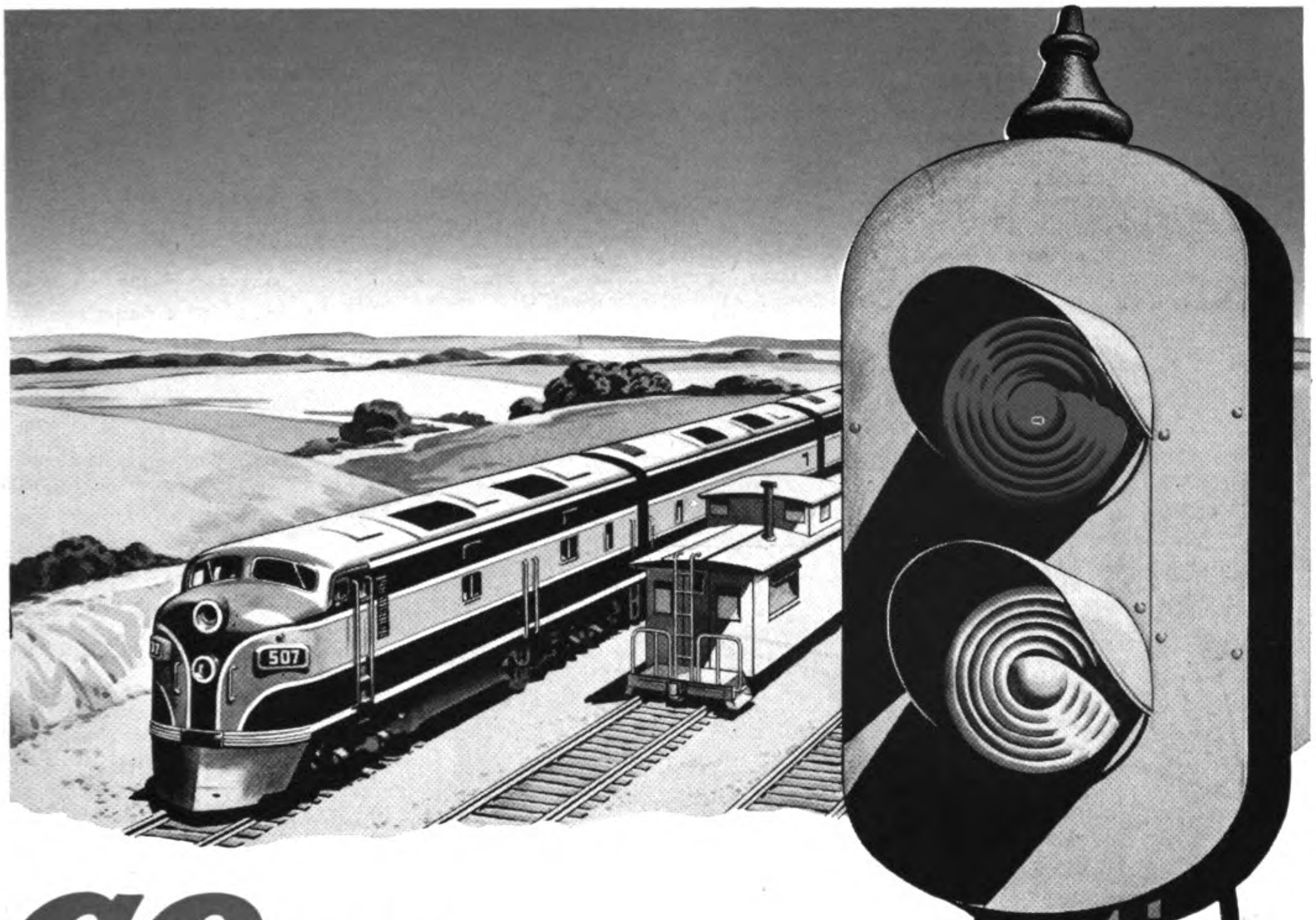
Chicago & North Western

H. H. Magill, acting superintendent of motive power, Northern district, appointed superintendent motive power, with headquarters at Chicago.

Chicago, Milwaukee, St. Paul & Pacific

F. A. Upton, master mechanic at Chicago, appointed assistant superintendent of motive power at Milwaukee.

R. E. Magnuson, assistant master mechanic at Chicago, appointed master mechanic, Chicago.



Chicago, Rock Island & Pacific

A. G. Mueller, general air-brake supervisor at Chicago, has retired.

L. F. LaRotonda, assistant diesel supervisor at Silvis, Ill., has been appointed air-brake supervisor, with headquarters in Chicago.

Delaware & Hudson

George H. Brown, assistant superintendent of equipment (locomotive) at Albany, N. Y., has retired.

Elgin, Joliet & Eastern

John P. Fitzgerald, road foreman of engines and assistant trainmaster, has been appointed system supervisor of air brakes, with headquarters at Joliet, Ill.

Bernard J. Tyrell has been appointed road foreman of engines and assistant trainmaster, Joliet division, with headquarters at Joliet, Ill.

Erie

Charles W. Rossa, road foreman of engines, Kent division, at Kent, Ohio, appointed road foreman of engines, Susquehanna and Tioga divisions, with headquarters at Hornell, N. Y.

Richard R. Mitchell, assistant to supervisor locomotive operation at Hornell, N. Y., appointed road foreman of engines, Kent division, with headquarters at Kent, Ohio.

Illinois Central

John S. Wray appointed assistant to general superintendent at Chicago.

New York Central

J. J. Larson, assistant master mechanic (car) at Buffalo, appointed general car inspector at New York.

D. J. Bourne appointed general foreman at Englewood enginehouse, Chicago.

E. H. Wright appointed assistant master mechanic, Michigan Central district, with headquarters at Detroit, Mich.

Southern

Henry E. Dyke, master mechanic at Selma, Ala., appointed master mechanic at Meridian, Miss. Position of master mechanic at Selma abolished.

Aurbey M. Cary, assistant master mechanic at Birmingham, Ala., appointed assistant diesel superintendent at Washington, D. C.

Howard G. Heinz, foremain air brakes at John Sevier, Tenn., appointed air-brake instructor at Knoxville, Tenn.

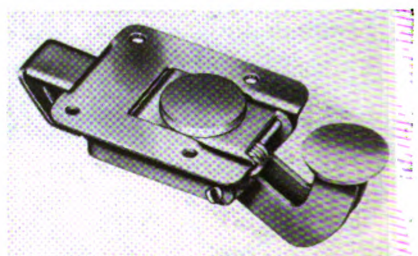
Cecil D. Schwine, Jr., appointed assistant master mechanic at Birmingham, Ala.

Kenneth L. Gentry appointed foreman air brakes at John Sevier, Knoxville, Tenn.

H. Wilbur Sanders appointed assistant foreman enginehouse (day) at Greensboro, N. C.

NEW DEVICES

(Continued from page 106)

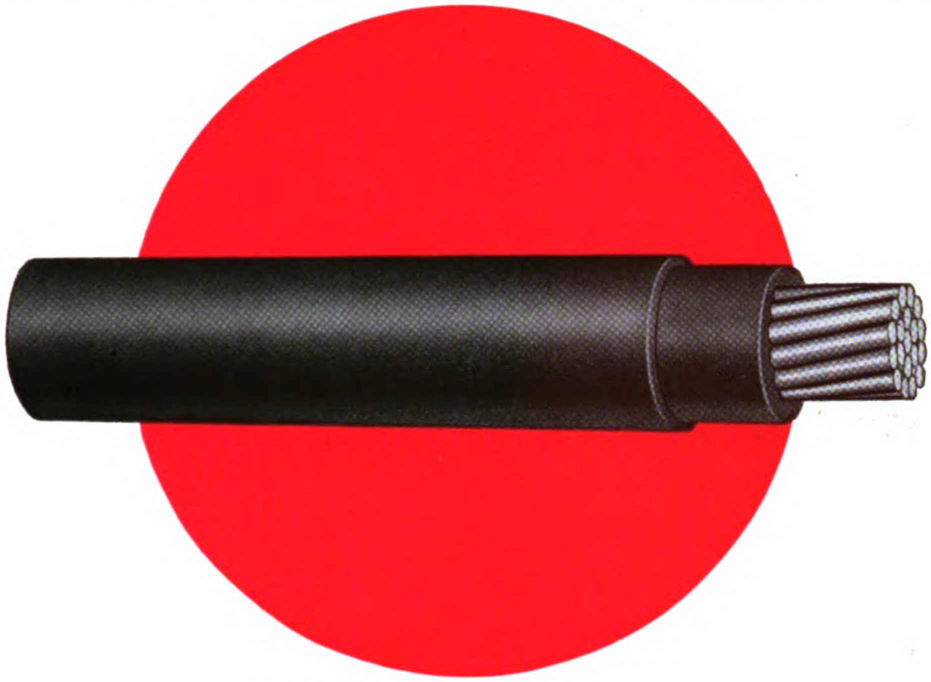


Push Button Flush Latch

A flush latch, designated part No. H-4100 has been introduced by the Hartwell Co., Los Angeles, Calif. This device is designed for a variety of industrial, transportation and commercial applications.

The unit mounts completely flush, the

CAR WIRING • DIESEL WIRING • SHOP WIRING • REWIRING



SIMPLEX
ANHYDROPRENE WIRES

For wiring installations where the use of ducts is required, you'll find ANHYDROPRENE Wires hard to beat for long, trouble-free service and economical operation. The reason? ANHYDROPRENE'S Anhydrex insulation and thin — but tough — neoprene jacket are more than equal to the hazards that make short work of ordinary wires. In addition, they contribute to low-cost installation and maintenance.

Take a look below at the features they provide and you'll see what we mean. Specify ANHYDROPRENE for your future wiring jobs and you'll see what **they** mean in more-satisfactory performance and in dollars saved.

- Flexibility
- Light Weight and Small Diameter
- Unexcelled Resistance to Water and Moisture
- Protection against Oils, Grease and Flame
- Resistance to Acids, Alkalies and Corrosive Chemicals
- Elimination of Braids that Fray and Rot
- Easy Pulling through Ducts without Use of Lubricants
- Molded or Stamped Markings for Instant Identification

For more-complete information write for Bulletin 115.

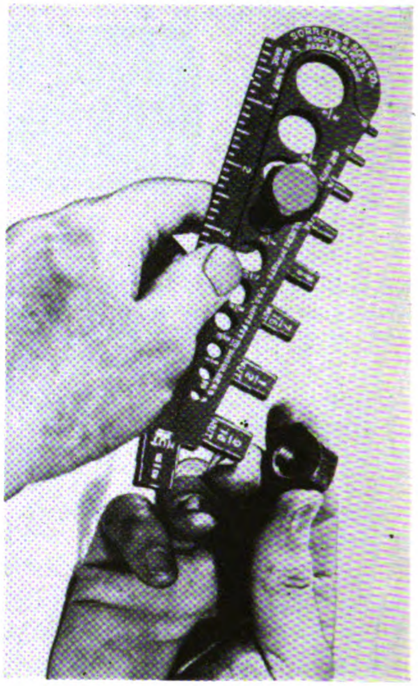
Simplex - WIRES & CABLES

SIMPLEX WIRE & CABLE CO.
79 SIDNEY STREET,
CAMBRIDGE 39, MASS.,

only exposed parts are the recessed, circular trigger button and close button. Finger-tip pressure opens the latch. As the forward button is depressed, the rear button raises, providing a grip for opening the door.

These latches are available in stainless steel, cadmium plated cold rolled steel or aluminum alloy and weigh from 0.7 to 2 oz. according to material.

◆



Pocket Style Bolt and Nut Gage

A light-weight pocket style bolt and nut gage has been announced by Sorrell & Sons Co., Rocky River 16, Ohio. Made of wear-resisting polystyrene plastic in bright colors, the device will gage bolts and screws from #8 through ¾ in. dia., nuts from #8 through ⅝ in. dia.

Bolts are gaged by pushing them through the size holes and the nuts by dropping them on the "plugs" on the top edge of the gage. The plug gages tell not only the diameter of the nut but tell whether it is coarse thread or fine thread.

Accurate to 0.005 in. tolerances, the gage measures only 7¼ in. overall.

◆

Machine Tool Magnetic Chuck

The advantages of magnetic chucking have been made available for smaller machine tools and for bench work through the addition of three small electromagnetic chucks to the line of devices manufactured by the Hanchett Magna-Lock Corp., Big Rapids, Mich.

These magnetic chucks in sizes of 5 by 10 in., 6 by 12 in., and 6 by 18 in., facilitate holding work pieces for hand sawing, scraping, layout, filing, welding,

have a life rating of 3,000 hr. at 5 hr. per burning start, and 4,000 hr. at 10 hr. per start.

One lamp, the H400-R1, generates light of the regular mercury color. It has a lumen output of 14,500 and carries a list price of $24.00. The other lamp, the H400-RC1, is physically the same except for a coating of phosphor on the inside face of the outer bulb. This improves the color quality of the light, particularly in its effect upon the human complexion, and helps smooth out the light beam. The lamp has an output of 10,000 lumens, and its list price is $28.00.

The new mercury lamps are companions to the R-52, 500- and 750-watt reflector high-bay filament lamps introduced a year ago, and are expected to be used with them in many installations. The R-52 lamps give substantially even illumination when the space between units is not greater than the height at which they are mounted. The bulbs should be shielded against falling water, and for best performance should not be touched by accessory equipment.

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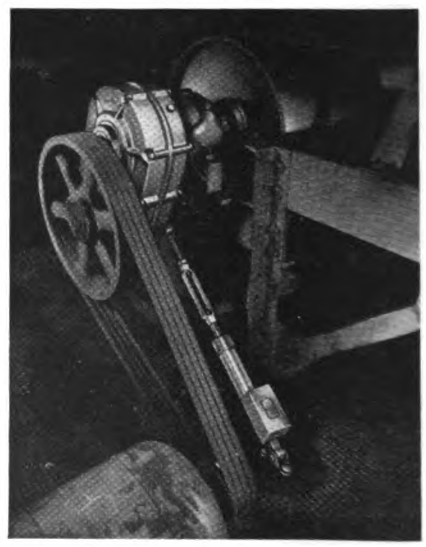
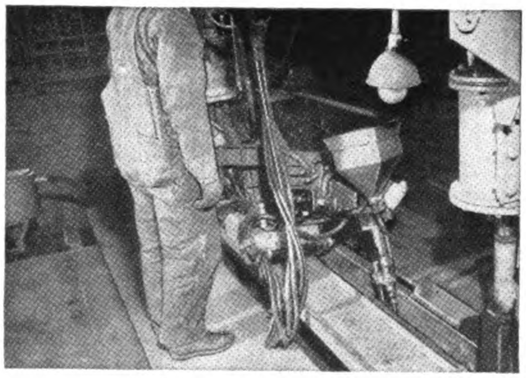


Shaft-Mounted Speed Reducer

Recently introduced is a new unit, a double-reduction shaft-mounted speed reducer

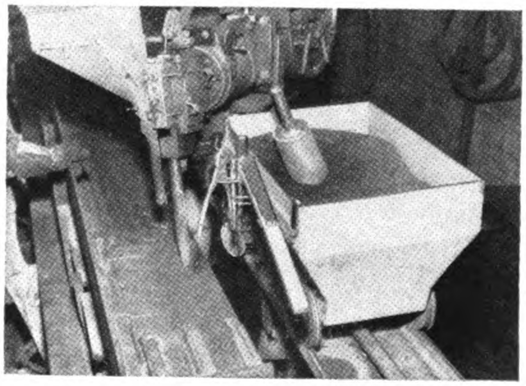
Step Up Car Building with *Unionmelt* Welding

Trade-Mark



91 ft. of strong welds are made in less than 8 minutes welding time on these baggage car side sheets . . . The UNIONMELT installation used in this efficient setup makes 13 different welds — requires little manipulation.

Sound welds between the web and top plates of these car bolsters assure stronger, better cars . . . A UNIONMELT machine makes the welds between the $\frac{1}{4}$-in. web and $\frac{3}{8}$-in. steel cover plates at about 35 in. per minute.



In order to make cars strong, parts are welded into the sill making them integral with it. This UNIONMELT setup has no trouble making the required welds for the rear draft lugs, through slots in the sill.

Where joints were previously not adaptable for automatic welding, the UNIONMELT flexible machine now makes clean, sound welds.

Major car building programs have included UNIONMELT welding for years. . . . And every month, railroad shops all over the country are adding more and more efficient and economical UNIONMELT installations. The reason is plain and simple: UNIONMELT *welding means higher production at lower cost.*

Here are just a few reasons for including UNIONMELT welding in car building programs:

If you would like to know more about UNIONMELT welding and car building, send for booklet F-7767.

OXWELD RAILROAD SERVICE COMPANY
A Division of Union Carbide and Carbon Corporation
UCC
Carbide and Carbon Building   Chicago and New York
In Canada:
Canadian Railroad Service Company, Limited, Toronto

OXWELD RAILROAD SERVICE

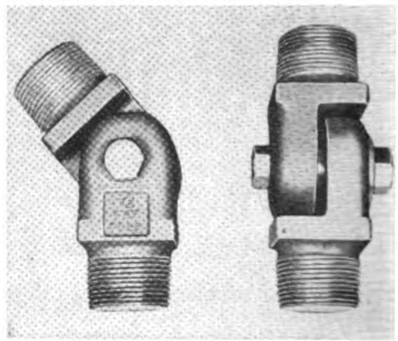
SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

with a capacity to 43 hp. and for output speeds from 12 to 110 r.p.m. It is a product development of the Dodge Mfg. Corp., Mishawaka, Ind.

This device, the No. 7 Torque-Arm Speed Reducer, brings the number of sizes in the manufactured line to eleven—divided in two series, single and double reduction.

The reducer has a 59 per cent greater hp. capacity than the No. 6. Like other models, it is shaft-mounted and anchored with a torque arm which fastens to any fixed object. A turnbuckle enables fast, easy adjustment of belt tension. Installation is simple as there is no foundation to provide and no flexible couplings are required.

In a typical application, illustrated, the reducer is mounted on the shaft of the solid steel head-pulley of a sand belt conveyor. Here, the anchoring arm is equipped with the Dodge Tri-Matic overload release. In the event of overload, the release trips; instant action loosens the belts, cuts off power and gives an alarm.

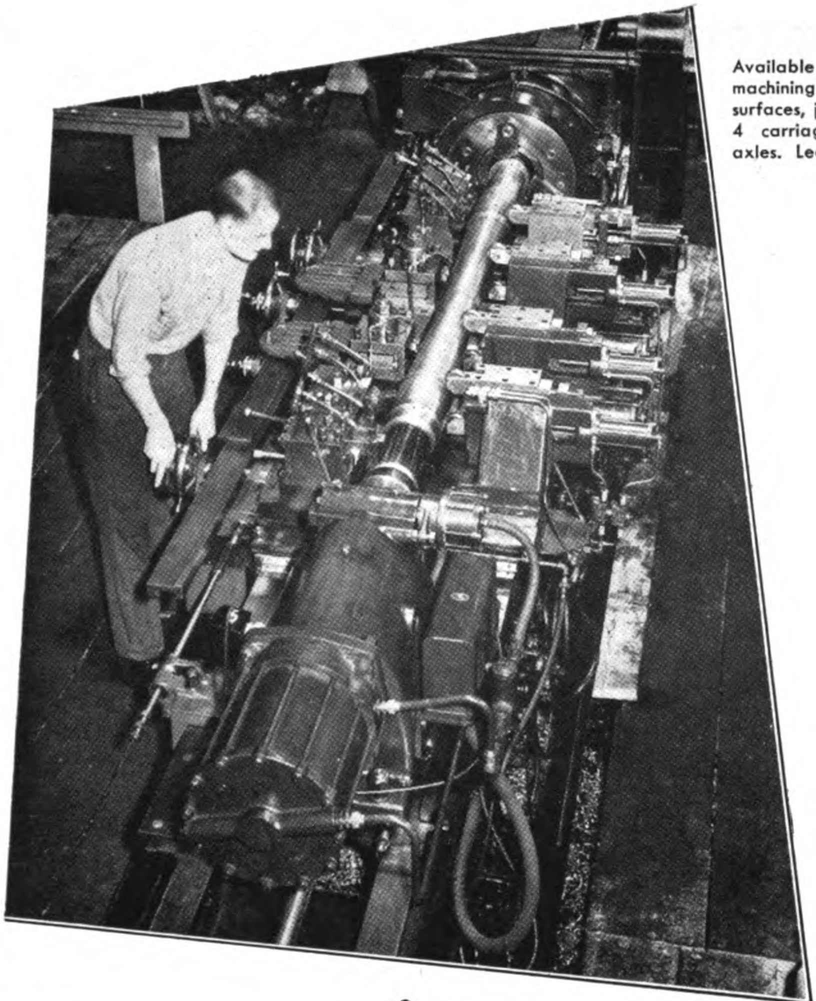


Adjustable Angle Suspension Fitting

The Thompson Electric Company, Cleveland, Ohio, has just announced a new adjustable angle fitting which permits accurate vertical suspension of overhead type electrical equipment from sloping or arched roof members. This unit features 90-deg. adjustment and also permits angle mountings from wall posts or columns. Originally developed for use with Thompson disconnecting-lowering lighting fixture hangers, it can be used to suspend other types of lighting units, loud speakers, unit heaters, overhead fans, blowers, motor platforms, and other electrical equipment weighing up to 1,500 lb. When utilized with floodlights, this fitting facilitates balancing in any vertical or radial position so that lights can be focused independently.

The adjustable angle fitting is fabricated of high-strength heat-treated aluminum alloy with machined conical seats for hard, radial knurled double-cone plugs which join the halves. The parts are keyed into position after adjustment by tightening the draw bolt. When set, the fitting will hold its position up to the maximum load capacity of the component parts.

The fitting is available in three types. The light-duty model has ¾-in. male pipe threads and is designed for units weighing



Available with two carriages for machining wheel seats, dust guard surfaces, journals and collar; or with 4 carriages for turning complete axles. Leaves no jaw indentations.

NILES can *cut* your axle-machining time in 1/2

This Niles end drive axle lathe—with its fast, easy set ups, accessible controls, modern feeds and speeds—is a truly *high-production* shop tool. In its design are combined so many time saving features that most users machine an entire axle in 1/3 to 1/2 the time required by ordinary methods.

It's a versatile, powerful machine with all the extra ruggedness and brute force for which Niles tools are famous. Which explains why down-time will be almost non-existent—productive time always at a maximum.

If your present axle-machining methods are keeping shop costs unnecessarily high . . . *write* for complete information. Or better yet, call your nearest BLH representative.

BALDWIN · BLH · LIMA-HAMILTON

Lima-Hamilton Division
BALDWIN-LIMA-HAMILTON CORP.
Hamilton, Ohio

BALDWIN-LIMA-HAMILTON

under 60 lb.; the medium-duty fitting with 1-in. male pipe threads handles loads from 60 to 100 lb.; and the heavy-duty model with 1¼-in. male pipe threads is capable of suspending equipment weighing up to 1,500 lb.

◆

Chest-Mounted Faceshield

Improved vision, elimination of "dead air" space, and relief from binding discomforts are some of the advantages attributed to a protective faceshield announced by Mine Safety Appliances Co., Pittsburgh 8, Pa.

Called the Chest-Mounted Faceshield, this protector is supported by adjustable neck and the chest straps which provide balanced weight distribution. A pliable leather pad rests on the chest without pressure or binding.

The adjustment feature is carried over to the visor itself to provide maximum vision and protection while it can be set at any desired angle, height or distance A metal hinge device enables the worker to make adjustments to individual requirements.

One of the features of the device is the relief from head strain. Allowance is also made for near-maximum ventilation; air gets to the worker's face from all directions to supplant the "closed in" feeling.

The standard model is supplied with a clear Chipruf visor 8 in. long by 0.040 in. thick. Visors are available in various sizes for impact resistance, for chemical splashes, and for hot operations.

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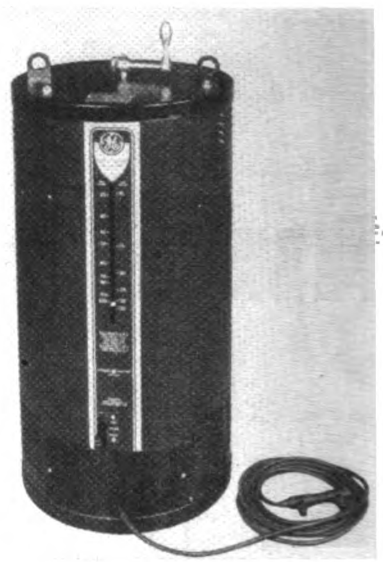


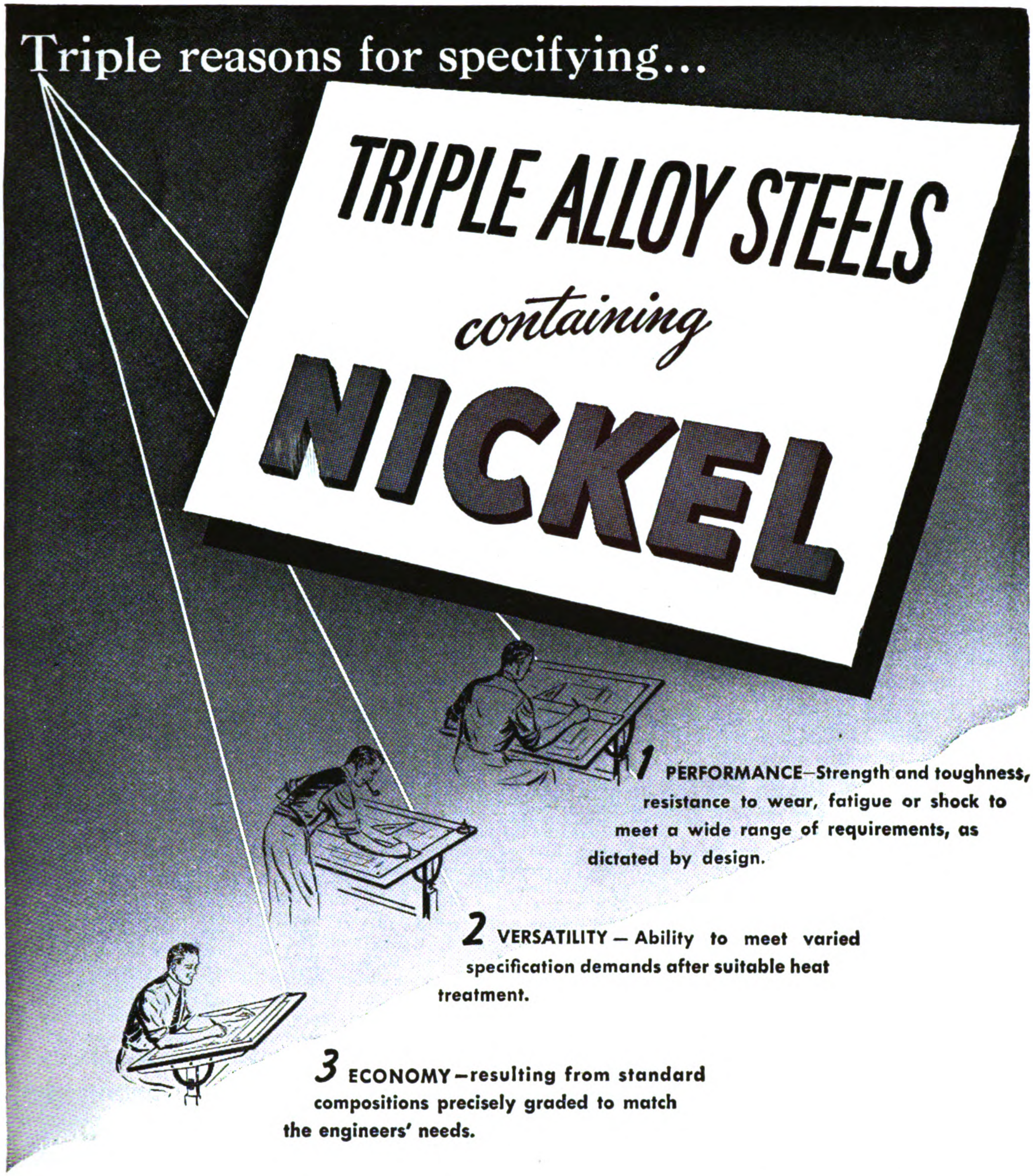
Atomic Hydrogen Welder

A redesign of its atomic-hydrogen transformer welder, incorporating a new hot-start circuit, silicone insulation, and an extra-wide current range, has been announced by the Welding Department of the General Electric Company.

The new design, according to G.E. engineers, not only results in a quicker starting, more durable, more versatile welder than the superseded model, but also permits a 17 per cent reduction in price.

The extra-wide current range of 10 to 100 amp. allows the use of one machine on all applications. The range is divided into two sections, 10 to 35 amp., each extending the entire length of the indicator scale. This allows more precise current settings.

Other advantages of the new welder are noted as a longer coil life because of the silicone insulation, faster starting with the



Experience shows that triple-alloy steels containing Nickel are solving some mighty big problems in many industrial fields. They have established outstanding service records in some of the most exacting applications. The many standard compositions available make it possible to select *accurately*, and with economy, triple-alloy steels to fulfill the requirements of a great variety of applications.

We invite inquiries regarding the selectiou and uses of triple-alloy steels, containing Nickel.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N.Y.

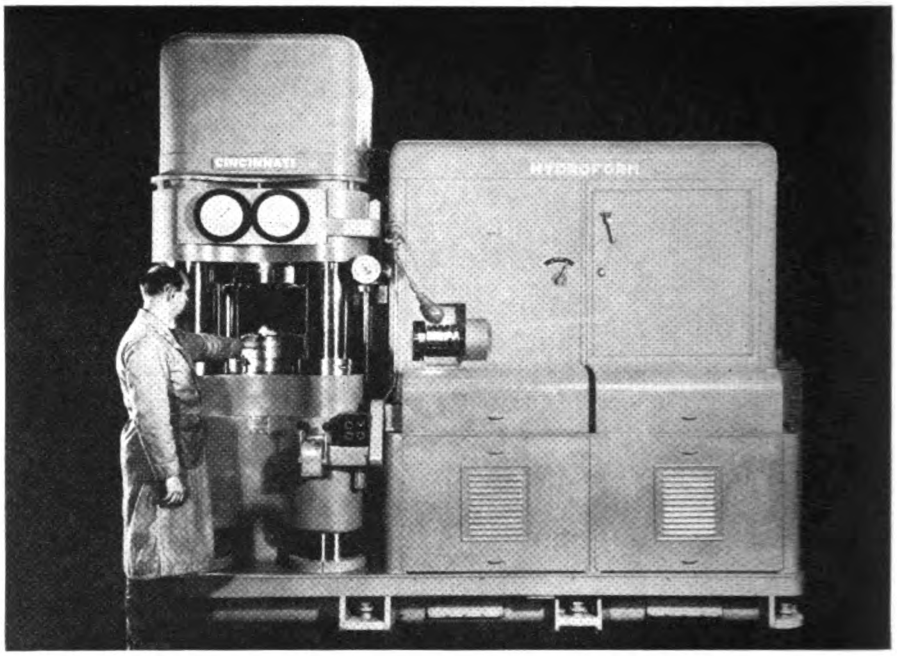
new hot-start circuit, and a range switch to change from one current range to another without moving the welding cable.

Features of the older model welder which are retained are power factor correction capacitors, portable "start-stop" push-button, automatic gas shutoff, and stepless current control.

The welder operates on 60 cycles, single-phase voltage, with a 75-amp. rating. It is 41½ in. high, 18¾ in. in diameter, and weighs 350 lb.

◆

Metal Forming Machines



A line of metal forming machines, known as Hydroform, have been introduced by the Cincinnati Milling Machine Co., Cincinnati 9, Ohio. These units are marketed in 12 and 26 in. sizes, and can be made in sizes up to 40 in.

The devices operate on the principle of a solid punch member moving into a flexible, hydraulically pressurized die member; an oil cavity capped with a flexible diaphragm. Sheet metal between these two members is hydraulically formed to the shape of the punch.

In operation, the flexible die member is lowered and locked, initial pressure is released, and then the punch member moves upward into the flexible die member. The blank is pressed tightly against the draw ring to control metal flow. As the punch moves up, pressure is automatically increased on the blank being formed, and the metal is subjected to uniform pressure from all sides. Stripping is accomplished automatically as the punch is retracted. Matching die sets are not necessary.

The machines consist basically of a heavy base in which the bolster plate and punch are mounted, a dome which contains the flexible die member and four strain rods for containing these units. The hydraulic system is equipped with a cooling unit to maintain proper oil temperature. An automatic cycle control unit is arranged with adjustable dogs or master cam plates to control the complete cycle.

Maximum pump pressure developed by the hydraulic system is 8000 psi., although up to 15,000 psi. may be generated in the die member as the punch moves up during the forming process.

To promote safety, the dome is interlocked in its up position while loading and unloading, and in its down position while the work is being formed. The dome control lever can be moved only after a function has been completed. It has a two-position "form speed" control lever to regulate the speed of the forming stroke.

Single-Stage Double-Suction Pump

Design improvements in its line of small, single-stage, double-suction pumps have been anounced by the Ingersol-Rand Co., New York 4. These pumps, known as class DMV-DHV, incorporate double mechanical shaft seals with sealed pre-lubricated bearings. Built in 3, 4, 5 and 6 in. sizes, the DMV (for medium heads) and the DHV (for high heads) are designed for general hydraulic services at temperatures up to 200 deg. F. capacities to 2100 gal. per min. and pressures to 150 psi.

Casing design has been made compact and simple. The elimination of stuffing boxes has decreased the shaft length between bearings, making the shaft more rigid. The shaft is not threaded, reduced or slotted at any point over its unsupported length. This construction eliminates any point on the shaft where stress concentration and possible fatigue failure might occur.

Through standardization, three spare parts kits serve all eight pumps in the DMV-DHV line. These kits contain all the parts necessary for a mechanic to restore

(Continued on page 142)

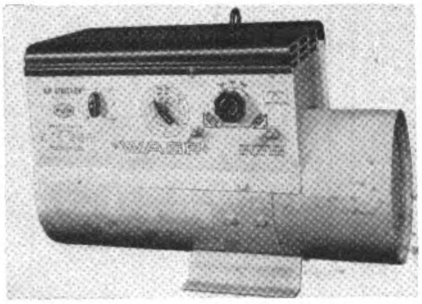
the pump to its original performance.

Cast iron casing, carbon steel shaft and bronze impeller are used to equip the pumps for any non-corrosive service.

◆

D.C. Arc Welders

Model GA "Wasp" direct current arc welders, available in 150- and 200-amp. sizes, have been announced by Air Reduction Sales Company, a division of Air Reduction Company, Inc. Designed to further advance the efficient performance of the Wilson line, the volt-ampere characteristics of



these machines make them especially suited to d.c. straight-polarity Heliwelding with Thor-Tung. Good commutation at all settings, plus the advantages of self-excitation and split-pole, cross-field design are said to provide good operation at all current settings. Continuous overlap from each current range to the next provides an unbroken range of welding current from 30 to 250 on the 200-amp. welder, and 20 to 185 on the 150-amp. machine.

The machines are easily portable when mounted on a two-wheeled carriage and require small floor space because of their compact construction.

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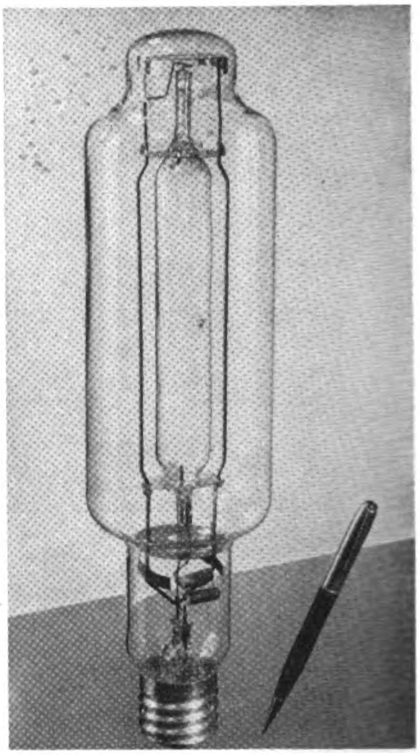


1000-Watt Fluorescent Mercury Lamp

To meet the trend toward larger manufacturing spaces, higher mountings and higher lighting levels both indoors and outdoors, Westinghouse Electric Corporation has made available a 1000-watt, C-H12 fluorescent mercury lamp.

Similar to the 400-watt, J-H1 fluorescent mercury lamp, this new light source provides a golden white light suitable for all types of lighting service except those where close color discrimination is involved. Its ballast is the same as that used for the 1000-watt, A-H12 lamp, and its BT-56 bulb has a specially developed isothermal shape that allows the phosphor coating to function at maximum efficiency.

When activated by invisible ultraviolet light from the quartz arc the phosphor gives off red light. This blends with the blue-green-white light from the mercury arc to give a golden white light with approximately the same color quality as a mixture of equal wattages of mercury and incandescent light. Inside frosting of the bulb provides better diffusion of light and greater uniformity of color.

When used outdoors fixtures should be designed to protect the bulb from a driving rain or moisture-laden insects.

A Test for Lubricating Oil Stability

By
C. O. Johnson,
Research & Test Engineer,
Seaboard Air Line Railroad Company

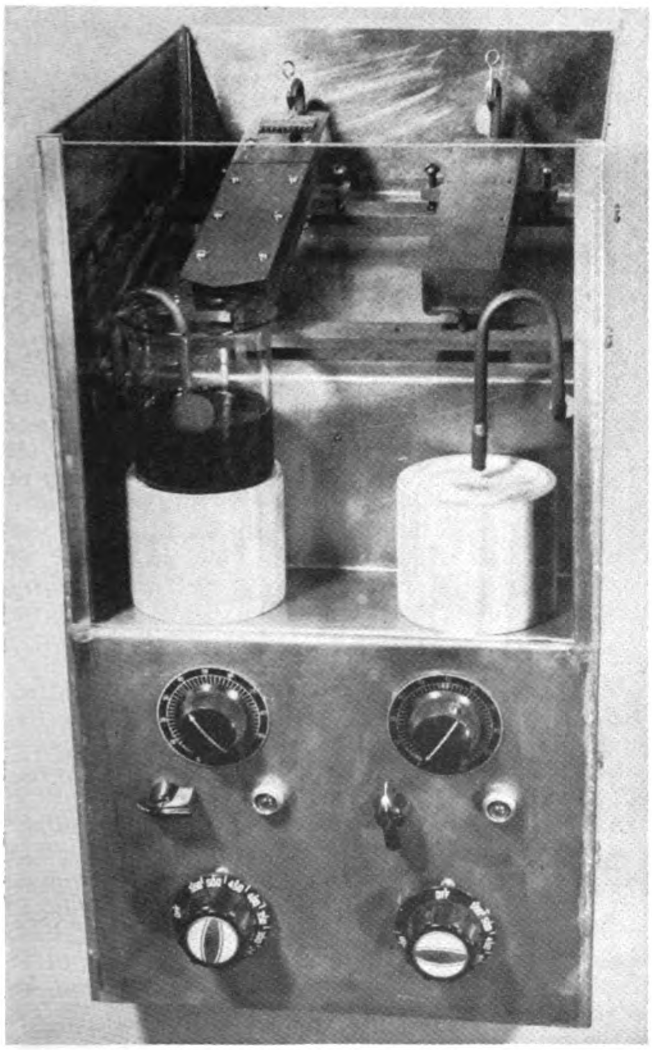


Fig. 1

THE present use of heavy-duty oils in diesel locomotives has presented many problems to those in charge of lubrication. Since there are a great many of these oils available, each compounded with different additives, the problem of selection and comparison has, indeed, been most complex and difficult.

While the generally accepted methods of lubricating analysis of diesel lube oils have been very valuable, they have not always been compatible with test engine results.

The Research and Test Department of the Seaboard Air Line under the direction of W. D. Simpson, chief engineer, has, for some time, been investigating various methods of oil analyses for the purpose of evaluating new oils and the control of oils in the diesel engine crankcase.

While setting up the program for this work, I noticed that the United States' Bureau of Standards had developed a laboratory test for rating lubricating oils, known as "Stability Test for Additive-Treated Motor Oils," which had given good results and appeared to be very promising.

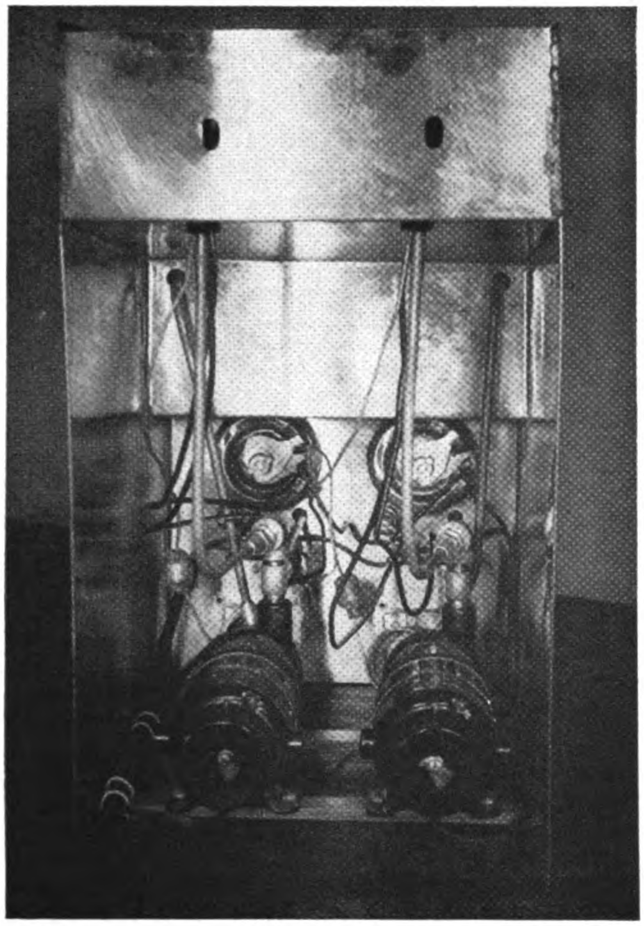
This method evaluates oils on the basis of characteristic deposits formed instead of actual changes of the oil in bulk.

Since, in the lubrication of the diesel engine, engine deposits are of prime concern, it is very desirable to know the point where additives have ceased to function.

A simple reliable laboratory method has been needed which would not only give the comparative amount of deposit which could be expected of un-used oils, but would also indicate when the additives in crankcase oils have become exhausted and of no further value.

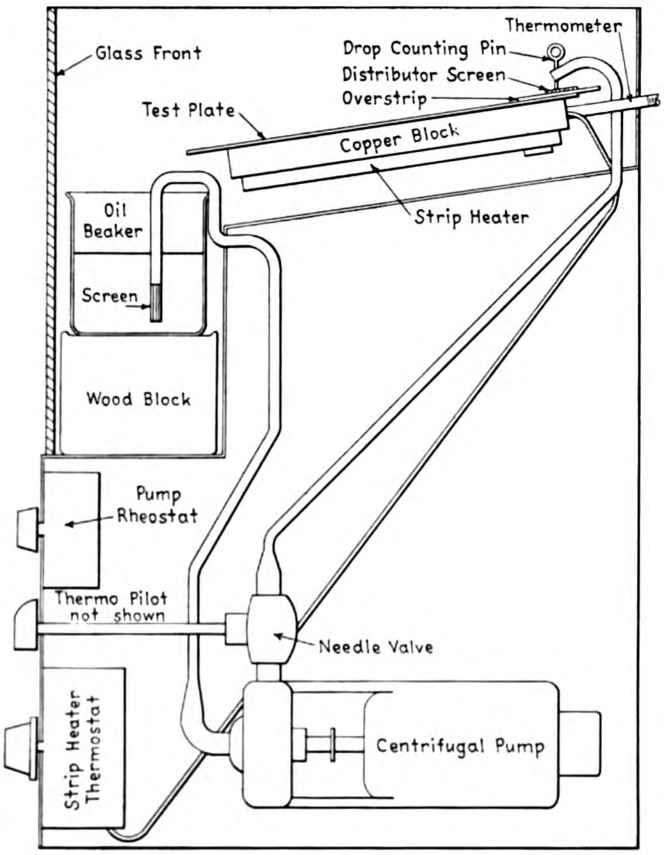
Extensive tests were begun in the Seaboard's Research and Test Laboratory at Jacksonville, Florida, to determine the value of the Bureau of Standard's stability test in comparing un-used oils and determining the condition of used diesel crankcase oils.

The test is fairly simple in principle, consisting of the flowing of a thin film of oil over a heated steel strip in the atmosphere and recirculating the oil for a definite period.



▲ Fig. 2

▼ Fig. 3



In order that the test results be comparable, it is necessary that the equipment used be capable of maintaining accurate oil film temperatures and flow rates within desired limits, and the tests run for two six-hour periods should be as completely automatic as possible.

The first tests in the Seaboard laboratory were made on similar equipment used by the Bureau of Standards and described in Analytical Chemistry, Vol. 21, May 1949, page 508, under "Stability Test for Additive-Treated Motor Oils." This equipment was found difficult to adjust and failed to give uniform results without very close attention.

In order to overcome the difficulties experienced with the Bureau of Standards' equipment, the apparatus shown in Figs. 1 and 2 was designed and built in the Seaboard's laboratory. Fig. 1 is a front view showing control panels, beaker, and test strip, while Fig. 2 shows the rear of the control panel and the centrifugal pumps. In Fig. 1, the left hand unit is complete with test strip and beaker ready for operation, while the right hand unit has test strip and beaker omitted.

Referring to Fig. 3, which is a diagrammatic sketch showing the arrangement of the principal parts, it will be noted that a strip heater is mounted in the upper right hand corner and on this heater a copper block is fastened. This copper block is 7 in. long, 1.5 in. wide and 7/8 in. thick. The test plate, a steel strip 9 in. long, 1.75 in. wide and 1/32 in. thick is fastened by eight steel machine screws—four on each side. The test plate overlaps the copper block and is pointed on one end.

Heater, copper block and test plate are inclined toward the oil beaker at the specified angle so that the oil may drop from pointed end of test plate into the beaker.

The overstrip is made of steel, 3 in. long, 1.75 in. wide and 1/32 in. thick and is fastened at the upper end overlapping the test plate 2.5 in. The distributor screen consists of a piece of doubled 20-mesh steel wire screen, 1.25 in. long and 0.625 in. wide, and is placed on the overstrip to assist in spreading the oil evenly over the test plate.

The copper block is drilled to receive a thermometer and a thermostat bulb. The oil circulating pump is a small laboratory centrifugal pump, and rate of flow is controlled by rheostat regulating the pump speed and a needle valve in the pump discharge line.

Drop counting pin is used to give a quick check of oil flow rate. The drop rate is calibrated against delivery in grams per minute of oil.

The suction line of the pump, fitted with a fine mesh screen, is immersed in oil contained by beaker. The oil is pumped from oil beaker through needle valve control to drop-counting pin.

The equipment contains two test units so that two oils may be run simultaneously.

The test strip and overstrip are prepared for the test from 1/32 in. galvanized sheet iron by stripping the galvanizing with 15 per cent HCl, washing with pumice soap, rinsing with tap water then distilled water, and dried. When this is done the test strips are weighed.

After the system has been flushed with test oil and adjusted, 130 grams of the test oil are weighed into a 250 ml. beaker. The beaker is placed in position, as shown in diagram Figure 3. This beaker is located so that it receives all oil which drops from pointed end of test strip. The steel overstrip and distributor screen are placed in position. The suction line of the pump is immersed in test oil contained in beaker.

The pump is then started and heater turned on. The temperature of the oil and of the test strip is controlled by means of the thermostat-bulb inserted in the copper

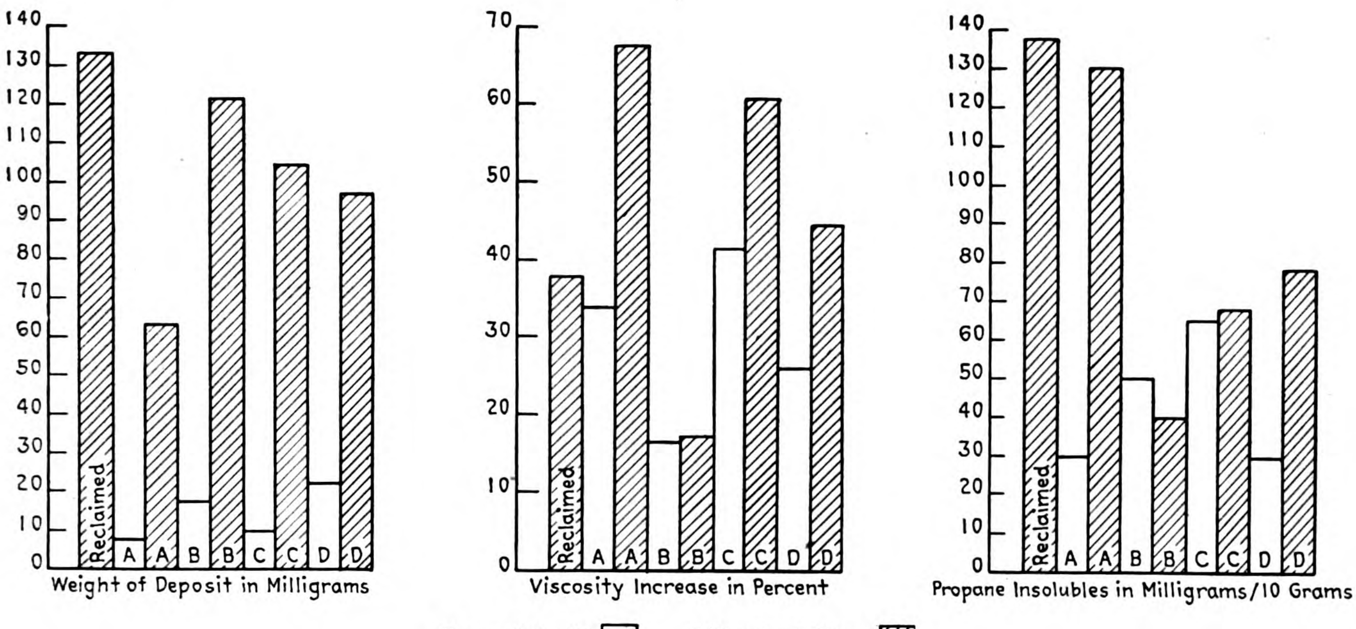
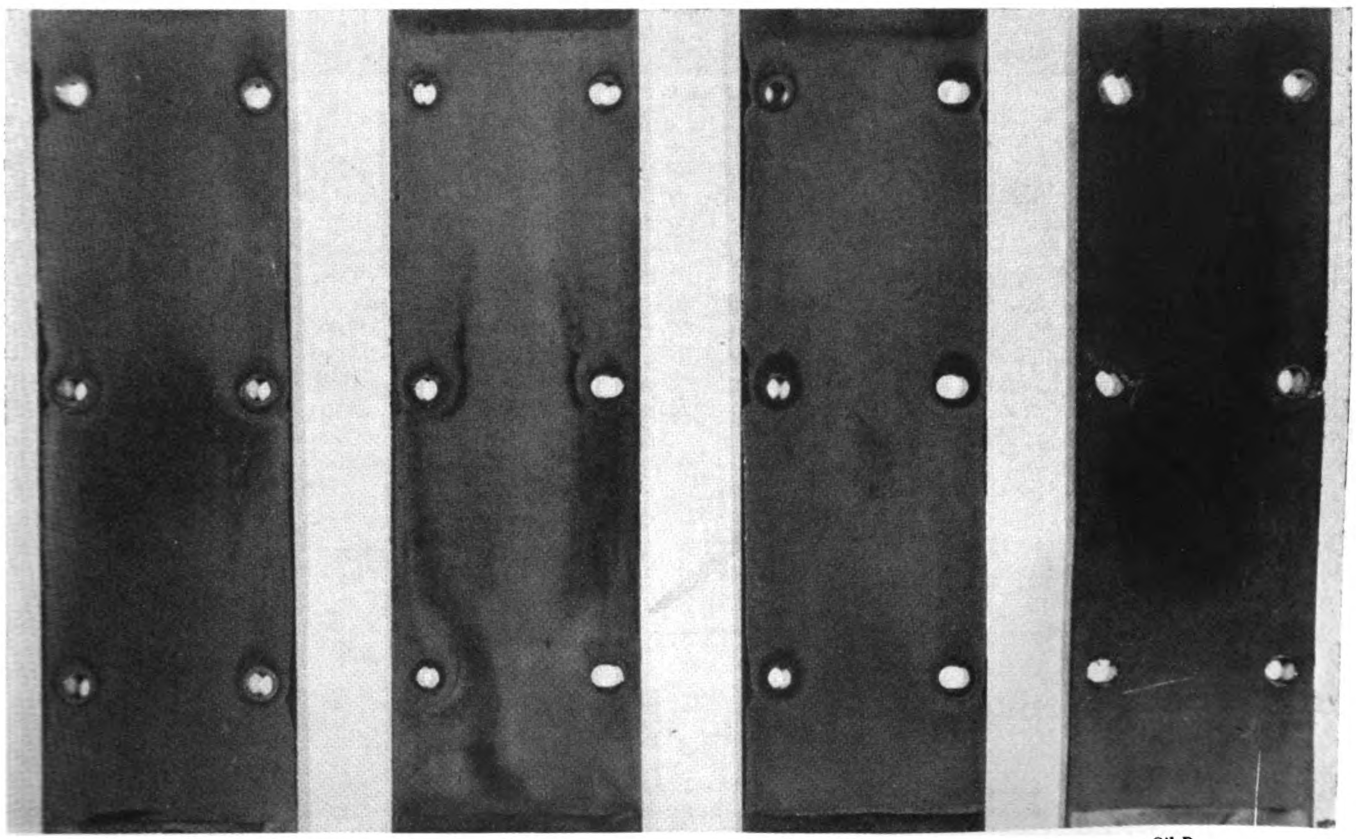


Fig. 4

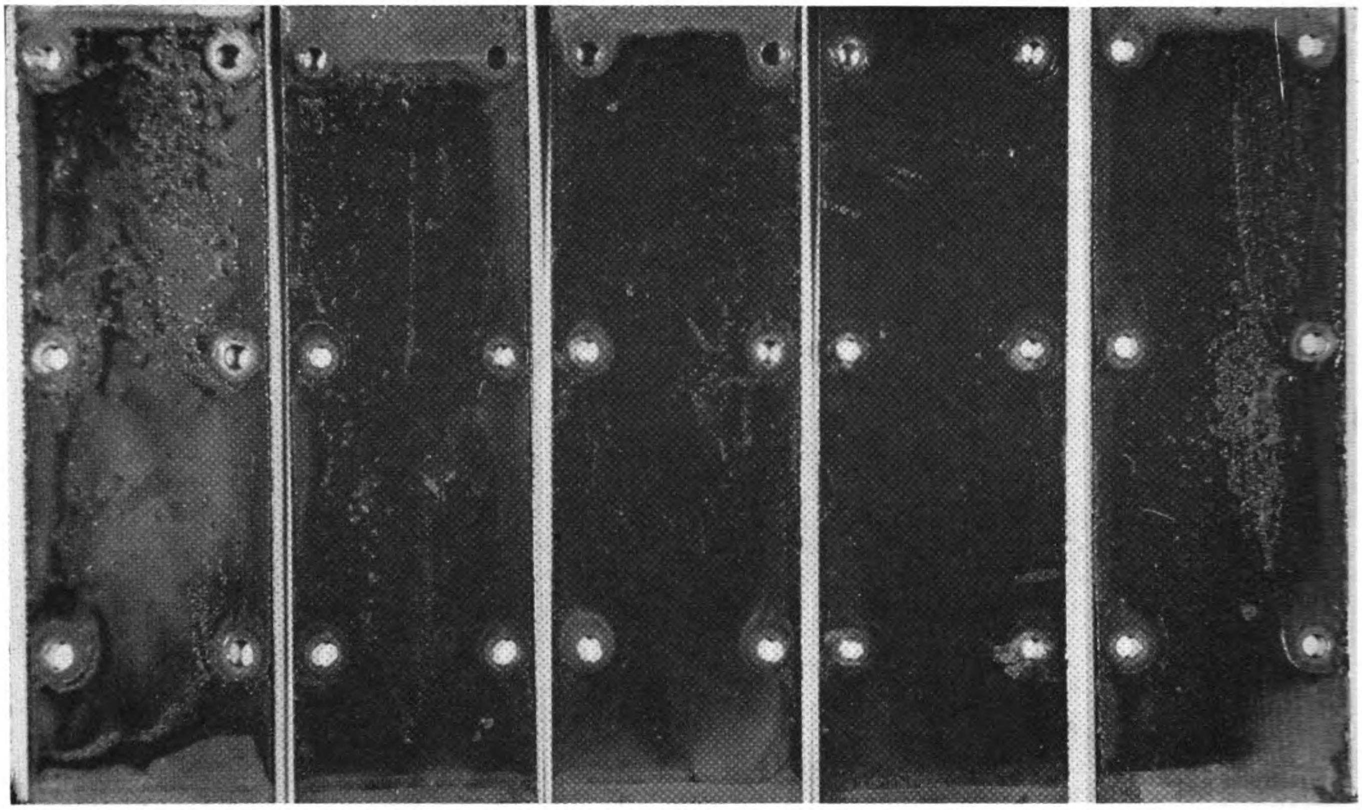


Oil A Oil B Oil C Oil D

Fig. 5

block, which is connected to the strip heater thermostat. This regulates the heat given off by the strip heater and maintains a constant temperature at any pre-determined value. Oil flow is regulated by means of the rheostat which controls pump speed and the needle valve in the oil discharge line. The test temperature is usually reached in about 0.5 hours and this temperature is held constant for period of test, two runs of 6 hours each.

At the end of the test period, the heater is cut off, the pump stopped, and the test plate removed. It is allowed to drain thoroughly, and is then cleaned with precipitation naphtha. In cleaning, the test plate is inclined, a strip of cotton gauze placed on the top of the test plate, and the other end of the cotton gauze immersed in a



Oil A | Oil B | Oil C | Oil D | Reclaimed Oil

Fig. 6

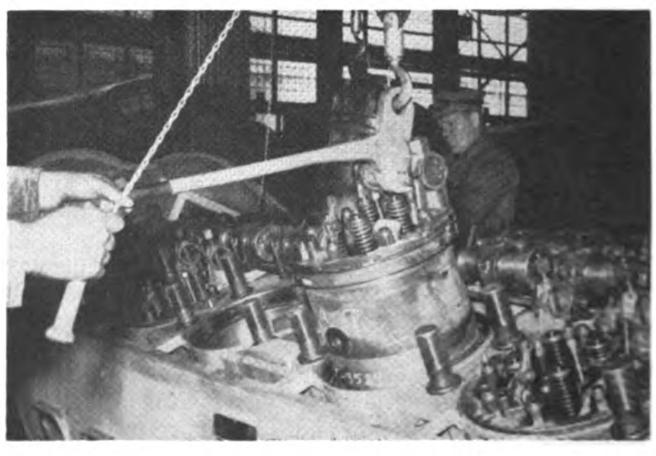
beaker of precipitation naphtha which is elevated higher than the end of the test plate.

This provides a gentle flow of naphtha over the test plate which washes all oil away without disturbing the deposit. The washing is continued on alternate sides of the test plate until the naphtha dripping from the test plate is colorless. The test plate is then dried and weighed. The difference in the weight of the test plate before and after the test is the amount of deposit formed during the test. Viscosities at 100 deg. F. and propane insolubles were run before and after tests.

Fig. 4 is a chart which gives, graphically, some typical results which have been obtained with the stability apparatus. In this case, a reclaimed oil was run, also four different base oils with and without additives. The base oils were obtained from four different oil companies, each of whom furnished a base oil without additives and the same base oil compounded with additives, as furnished for heavy-duty additive type oils.

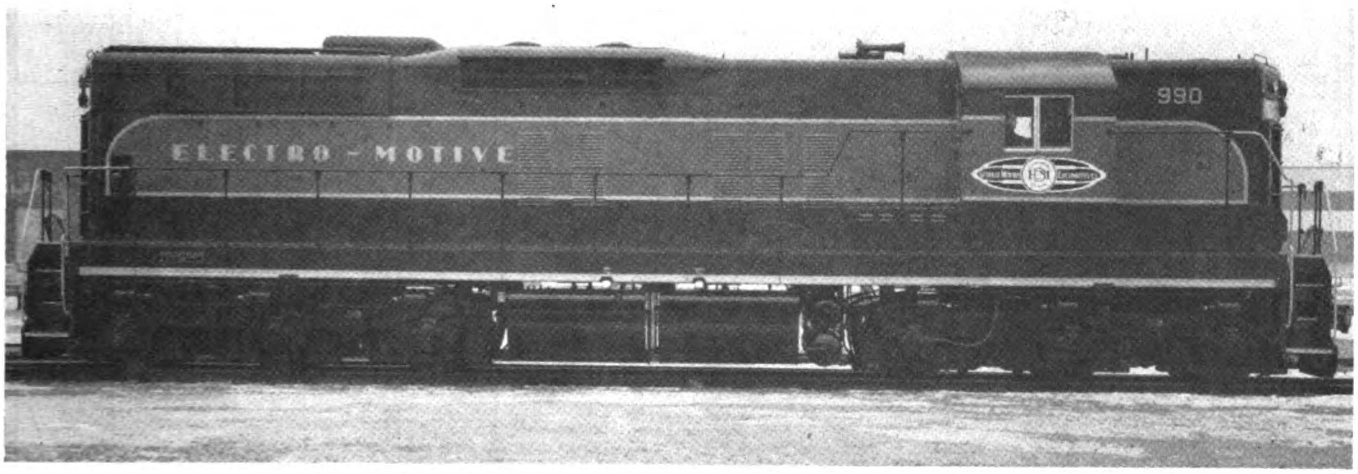
In the chart, Fig. 4, indicating weight of deposit, for example, base oil A shows approximate 63 mgs. of deposit, which base oil A compounded with additive for distribution as a heavy-duty additive type oil shows approximately 8 mgs. of deposit. After the test is run, the test oil shows an increase in viscosity and an increase in propane insolubles. Two photographs are included which show the affected areas of the test strips. Fig. 5 is heavy-duty oil and Fig. 6 is the same base oil without the additives. The oils designated by letters in Figs. 5 and 6 are the same oils as shown on chart in Fig. 4.

Diesel Liner Lifting Device



The lifting device shown in the illustration is used for removing diesel cylinder liner assemblies and reapplying them to the cylinder blocks. The lifter, being offset 2½ in. with a used rocker arm shaft welded to the lifter at a proper angle, permits lifting the assembly at a 22½ deg. angle. The handle acts as a guide while lowering the assembly into place.

The center distance of the two holes in the working end is 5½ in. and the end of the handle is about 29 inches from the fulcrum hole. An E.M.D. lifting eye and piston holding rod with retaining washer to keep the piston and connecting rod in the assembly while being lifted out of the cylinder block.



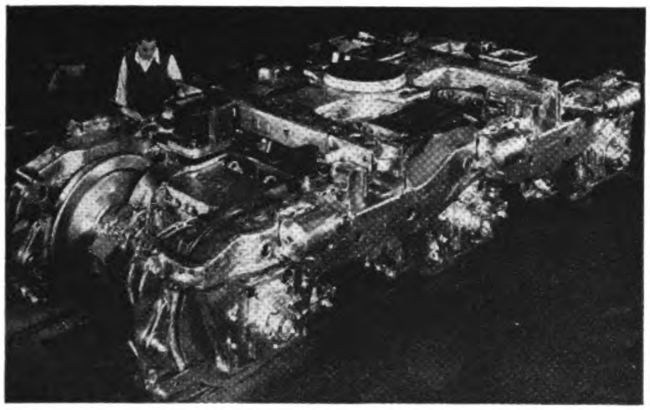
No. 990, the first G.M. diesel locomotive of the SD-7 type.

E.M.D. Builds Six-Wheel Switcher for Special Duty

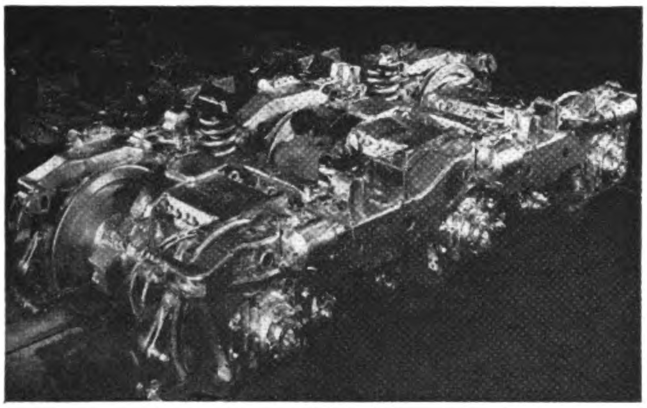
Front end construction and safety appliances.

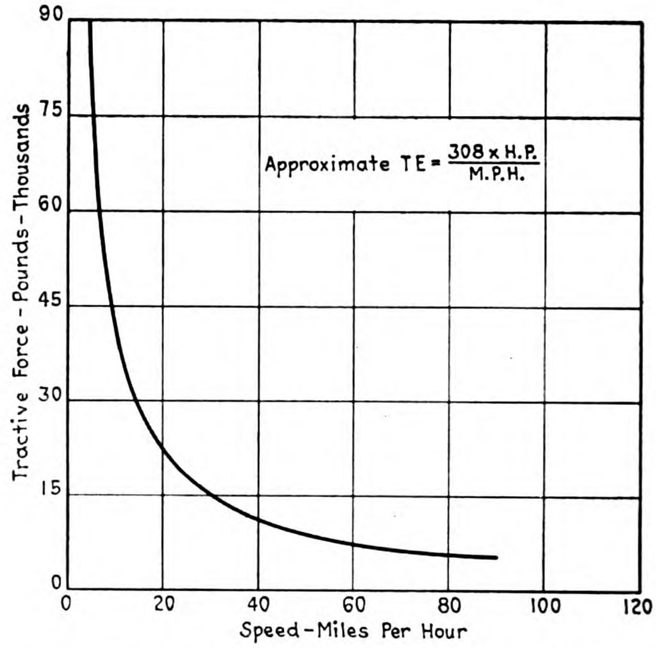
THE Electro-Motive Division, General Motors Corporation, LaGrange, Ill., is currently demonstrating a new Type SD-7 heavy-duty diesel road-switcher of 1,500-hp. capacity, with three traction motors geared to equally spaced wheels in each of two swivel trucks designed for exceptional flexibility and safe, smooth riding at high speeds. The locomotive weighs 52,343 lb. per axle and, with a 62 to 15 gear ratio, develops 78,515 lb. tractive effort at 25 per cent adhesion. Since January, it has been demonstrated on 10 of 32 scheduled railroads throughout the country and shown excellent results in a variety of services including heavy transfer, humping, helper, mixed trains, through and local freight, and yard switching.

For example, one road reports handling 1,500-ton trains on a 5-mile, 2-per cent grade with outstanding



Flexi-Coil easy-riding truck with three motors geared to equally spaced wheels. The bolster is removed (below) to show coil spring supports and easily accessible center motor.





Relation of speed to tractive force developed by the SD-7.

adhesion due to automatic sanding in conjunction with wheel-slip control. Another road reports one move in level territory with 102 cars weighing 5,500 tons, and 128 miles in heavy transfer service without wheel pick-up on rails made slippery by drizzling rain or snow. One report mentions exceptional ability to "kick" cars in yard switching and said that adhesions up to 25 per cent were attained on a 2-mile, 2-per cent grade. On one western carrier, the locomotive accumulated 1,966 miles, including 1,110 miles on seven freight-train assignments, 726 miles on five mixed train runs and 130 miles in a helper move when a minimum speed of 15 m.p.h. was maintained on the critical grade with a heavy train and the fuel consumption averaged 3.1 gal. per mile. On these tests, operating crews reported unusually easy-riding at 65 m.p.h.

In one passenger-train test run of 134 miles where a 4,000-hp. steam locomotive is normally used in order to make the schedule, the SD-7 was able to handle relatively light Sunday passenger and baggage business and save 1 hr. 14 min. on a 5-hr. schedule. An outstanding performance in transfer service, reported by a copper company in Utah, was the handling of 28 empty freight cars weighing 432 tons up a 4 per cent grade at a speed of 8 m.p.h. without excessive motor heating or wheel slippage.

In another test, the locomotive operated for 28 min. on a ruling grade with 24 automatic sanding applications totaling 8 min. and only three wheel slips. By way of contrast, a full train of 107 loads and 7 empties, or 9,614 tons, was handled on a 20-mile downhill run with the dynamic brake, air being used only three or four times to keep the train speed below 30 m.p.h. During this operation, full main reservoir air pressure was maintained by the provision for holding engine speed at 500 r.p.m. while in dynamic brake.

Condensed Specifications

The SD-7 locomotive is the newest in the General Motors No. 7 series, driven by one 16-cylinder 567 diesel engine with D-12 generator and alternating current accessory drive, the same as in F-7 freight and GP-7 general-purpose units. High capacity dynamic brakes and a 2,500-lb. per hr. steam generator are supplied as optional equipment. Roller bearings are standard and the WXG air compressor direct-driven from the engine shaft has a displacement of 336 cu. ft. per min. at 800 r.p.m.

The locomotive is 60 ft. 8½ in. long over couplers, has a truck center spacing of 35 ft., truck rigid wheelbase of 13 ft. 7 in., wheel diameter of 40 in. and is designed to negotiate safely a minimum curve radius of 250 deg. It has a capacity to carry 1,200 gal. of fuel oil, 1,200 gal. of water (optional), 200 gal. of lubricating oil, 260 gal. of cooling water and 50 cu. ft. of sand. The locomotive weighs 300,000 lb. to 360,000 lb. fully loaded and dependent on modifications

For heavy tonnage applications, the SD-7 can be equipped with either a 65 to 12 or 62 to 15 gear ratio, in which case the traction motors are self-protecting in most applications and operation limited only by available adhesion with speed limited to 55 and 65 m.p.h. respectively. Other gear ratios available for application where schedule rather than tonnage is the important consideration may be supplied as follows: 61 to 16, maximum speed 71 m.p.h.; 60 to 17, 77 m.p.h.; 59 to 18, 83 m.p.h.; 58 to 19, 89 m.p.h.

The Flexi-Coil Trucks

A feature of the SD-7 is the roller-bearing Flexi-Coil trucks which utilize a new principal in locomotive springing to give riding properties comparable to those of passenger locomotives. Full flexibility is secured by a "floating platform" design in which the bolster rides on

four sets of large diameter double-coil springs set in the truck frame with axles evenly spaced for better weight distribution. This coil spring arrangement is designed to give all necessary freedom of movement for full flexibility—with spring action suitably controlled by snubbers.

The result is a free-swiveling truck with each pair of wheels tending to follow the contour of the rail and carry its proportionate share of the load at all times. Tests are said to show that this can account for as much as 10 per cent less track stress with a given axle load. The construction is designed therefore to: assure better tracking with less flange wear; reduce stress on rail and structures; eliminate the tendency to turn over light rails; and provide better adhesion qualities for maximum tractive effort.

Maintenance Simplified

Simplicity and rugged design of the new Flexi-Coil truck are also said to assure ease of inspection and maintenance, due to fewer parts and the elimination of equalizers and loading pads. Brake shoes are easy to replace and, especially important, the center motor is readily accessible.

Outstanding features of the SD-7 design include: A new wheel-slip control system; clasp brake design for more efficient braking and easier maintenance; maximum interchangeability of parts with other G. M. diesel locomotives; provision of ample space for a full-grown man to change brushes easily on the center motor and of course readily reach end motors; brake shoes changeable without putting the locomotive over a pit; all major wiring and piping placed in a channel along the locomotive side with doors for easy access.

Exceptional visibility is afforded from the cab and full provision made for crew comfort and convenience, including fully automatic transition and notably smooth acceleration. The cab has forced air ventilation for summer operation and individual temperature control for winter.

Crane Shifts Loads and Straightens Car Parts

Two modifications made by the Peoria and Pekin Union to a conventional Roustabout crane with a 15-ft. boom and a 2½-ton hoist enable the crane to straighten loads shifted en route and to straighten and apply certain car parts. The first modification was simply the application of a wooden block to the channel-shaped end section of the boom. This block is expendable, normally requiring replacement about once a week, because it is soft enough to protect the lading when loads are to be shifted.

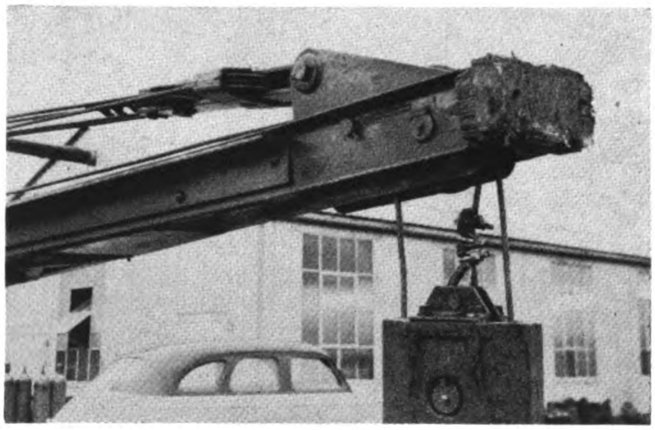
The second modification was to make the boom strong enough to perform the operations made permissible by the application of the wood block. This modification consisted of applying a reinforcing angle ½ in. by 3 in. by 5 in. along both sides of the boom from a point approximately 1½ ft. from the hoist end to 1 ft. from the car end.

The crane is used to straighten and to move for repairs all kinds of loads that have shifted lengthwise, including pipe, lumber, piling and tractors. It is also useful for reaching into gondola cars to adjust the load or to move it for repair work, and to transfer some types of loads between two different cars.

Normally loads are shifted or straightened with the crane running down a concreted runway between the rip tracks and pushing against the load as straight-on as possible. For some types of lading, such as light pipe if protected on the ends by caps, the crane can travel down the runway and push the load with the boom at right angles.

The crane is also employed for straightening side and end doors of box cars. This is done with a straight pushing action, and in conjunction with an oak timber 4 in. by 12 in. by 48 in. for even application of the force. Ladders on house cars are straightened with one end of a chain placed around the ladder and the other on the hoist. Straightening is accomplished by pulling in on the hoist, which method gives closer control than pushing by movement of the car.

Mobile crane adapted for shifting and straightening loads by reinforcing the boom and applying a wood block to the end.



The boom reinforcing angle and the expendable wooden block on the end to protect the load to be shifted.

Dynamic Testing of Freight Cars

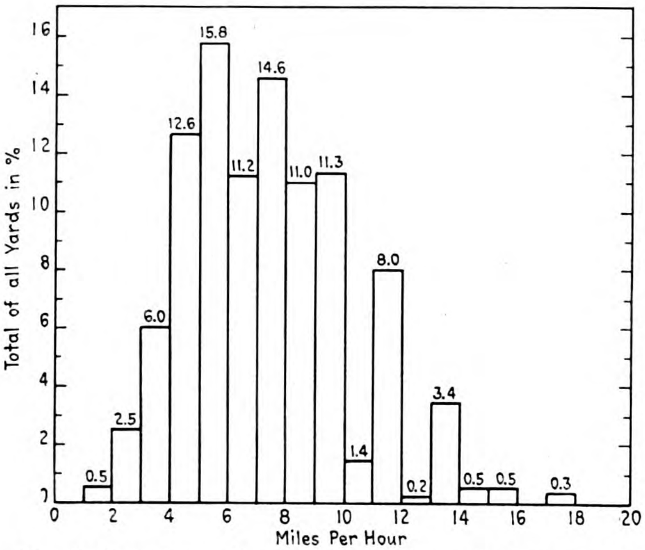


Fig. 1—Percentages of switching operations at various speeds during 555 impacts in the Chicago area.

The Class I railroads of the United States have reportedly paid over $100,000,000 annually for loss and damage claims made against them by shippers. Of the total amount approximately 70 per cent represents damage claims which are classified under "Unlocated Damage," "Improper Handling Damage" and "Concealed Damage." In other words, a high percentage of the annual damage cost exists because of the inadequacy of the present means of packaging and anchoring lading in order to protect it from the vertical and horizontal forces to which it is subjected in train service and in classification yard operations.

It is generally conceded, although no definite figures can be established, that the most serious damage to lading occurs during switching operations in classification yards. To get higher utilization out of the present day freight car fleet the speed with which trains are made up has been increased. This in turn has resulted in cars being subjected to higher impact velocities. Fig. 1 shows a bar

* Abstract of a paper presented at the June 1952 semi-annual meeting of the A.S.M.E. by Jack M. Roehm, Associate Director of Development, Pullman-Standard Car Manufacturing Company.

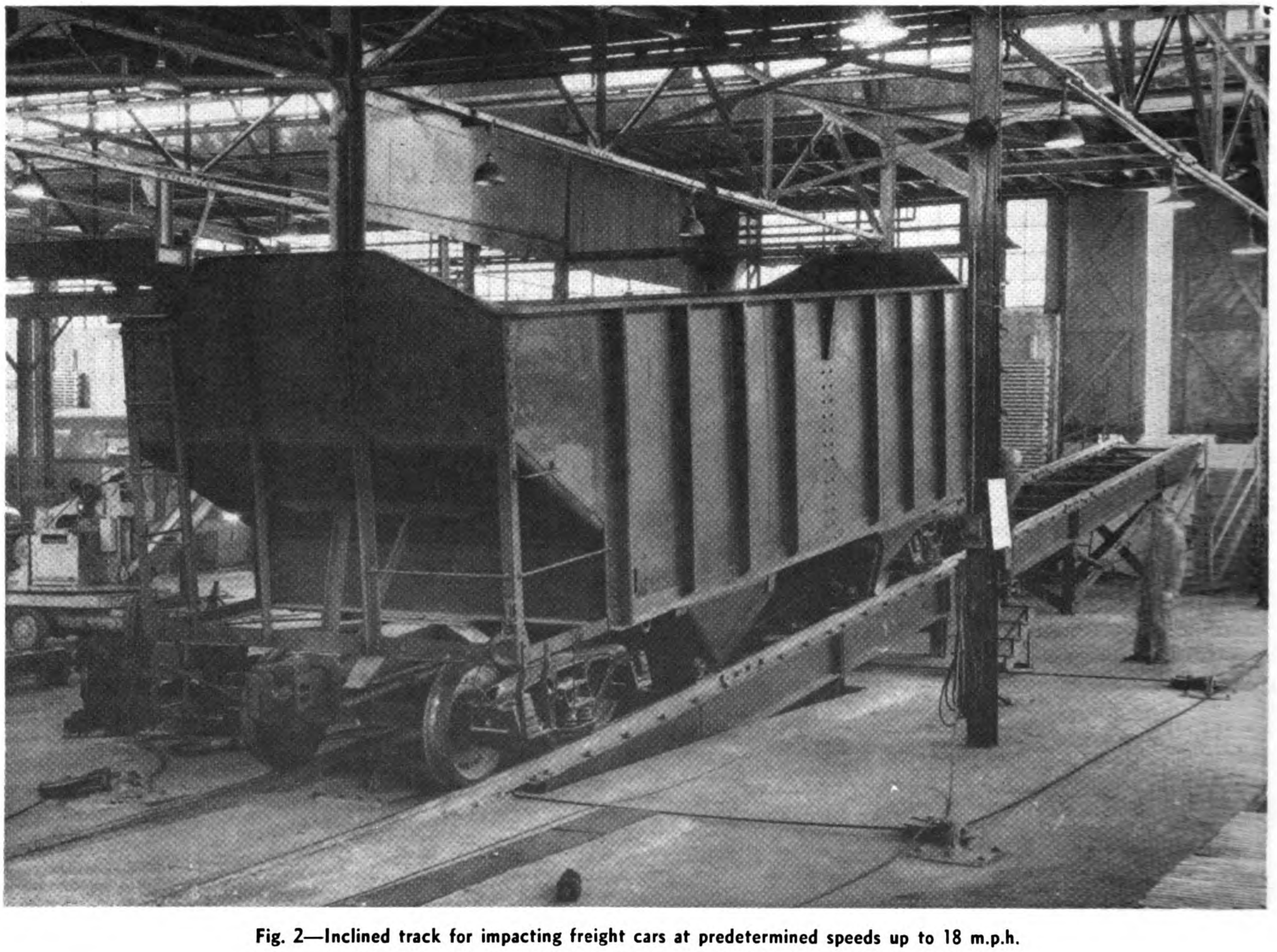


Fig. 2—Inclined track for impacting freight cars at predetermined speeds up to 18 m.p.h.

graph in which the velocity of impact is plotted against the frequency of occurrence. This data was collected from a representative number of classification yard operations. It will be noted that the mean speed of impact is 7 m.p.h. This is well above the velocity of draft gear closure. In fact only 22 per cent of the impacts occur below 5 m.p.h. and it is only for impacts occurring below 5 m.p.h. that the conventional draft gears afford protection to the car and its lading.

Since the railroads must be allowed to speed up their operations in order to efficiently meet traffic demands, and since there is a limit on what package designers can achieve at a reasonable cost, it becomes imperative that the railroad carbuilders and specialty manufacturers seriously concern themselves with the problem.

The first logical step in the solution of any problem is to gain as much knowledge about the problem as possible. Technically the problem is one of dynamic loading resulting from vibration and impact. This paper covers that part of the problem dealing with what happens to a freight car under horizontal impact. To gain knowledge about freight car impacts it is necessary to have facilities for testing and adequate instrumentation for measuring test results.

Pullman-Standard started a program for dynamic testing of freight cars about five years ago. Since that time the program has been continuously expanded and improved as basic data on testing has been gathered. To provide a means for impacting cars the indoor hump track shown in Fig. 2 was constructed. A car released from the top of the hump will attain an impacting velocity of 18 m.p.h.—high enough to wreck most freight cars. By releasing the car from a predetermined location on the ramp it is possible to obtain the desired striking velocity.

Having acquired the laboratory means for simulating service conditions the next requirement is to have proper instrumentation for measuring and recording data. Wherever possible, commercially available instruments are utilized. The measurements which are of primary interest are force, stress, displacement, velocity and acceleration. SR-4 electrical strain gages are used for measuring both force and stress. For the measurement of displacement and velocity special slide wire potentiometers were developed by Pullman instrumentation engineers. Statham Model R accelerometers are used for measuring accelerations. Data from the strain gages, potentiometers and accelerometers is recorded by both Hathaway and Consolidated recording oscillographs. Multiple-channel recording is absolutely essential for studying the distribution of forces, stresses and accelerations throughout a car structure under impact loads. As many as 30 channels are recorded simultaneously. In some tests as high as 175 strain gages per car are employed to take force and stress readings from the coupler. through the car body and into the roof.

Force on the coupler is one of the most important items to be determined under test. To achieve accurate measurements a special dynamometer coupler was developed. As shown in Fig. 3 the dynamometer coupler was constructed by removing a section of a standard Type E coupler and replacing it with a hollow steel section of SAE 4140 steel. Sixteen SR-4 gages were applied longitudinally to the four outside surfaces of the section, four to a surface, and the gages were wired in such a manner that bending caused by eccentric loading would be electrically cancelled. This coupler has linear characteristics to over 1,000,000 lb.

For a loaded freight car having the conventional draft

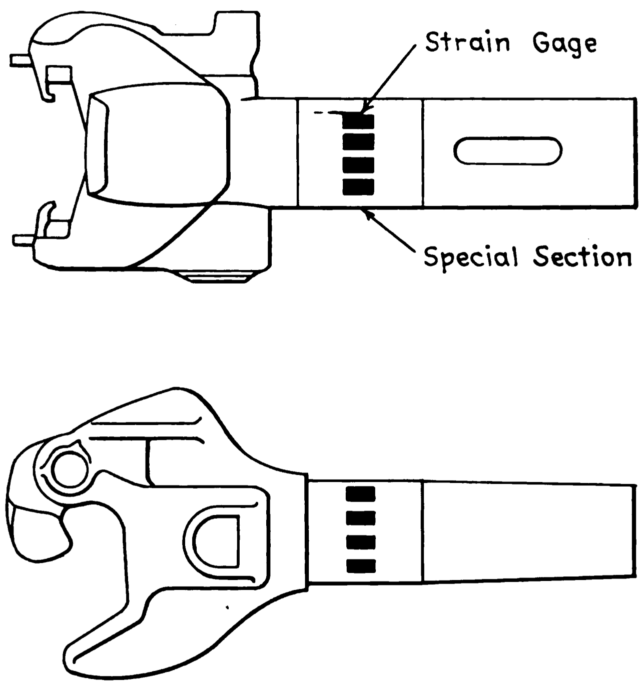
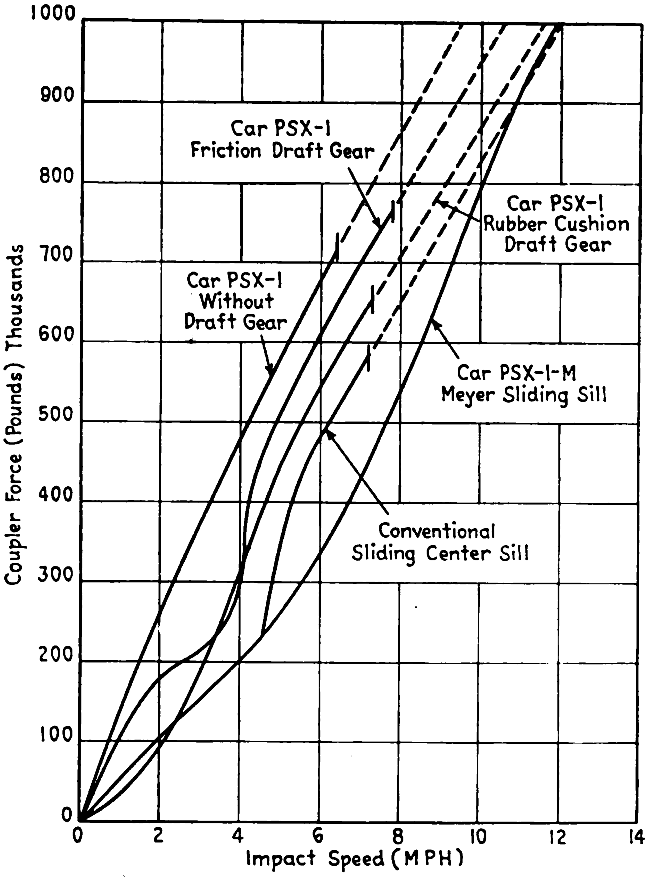


Fig. 3—Four SR-4 strain gages are applied to each of the four surfaces to determine forces on the coupler.

gear arrangement the force on the coupler can be taken as a measure of potential damage to the car structure, and the acceleration of the car body can be taken as a measure of potential damage to the lading. At first it might seem that the force on the coupler should be directly proportional to the acceleration of the car body because Newton's Second Law states that force equals mass times acceleration. The fact of the matter is that the force on the coupler and the car body acceleration are not in direct proportion. This is an important factor to remember in studying the dynamics of freight cars. The simple expression of Newton's Law is for a rigid body. A freight car is not a rigid body but is a series of masses more or less flexibly connected together. The body is one mass, the underframe another, the trucks two others, and so on, and all are flexibly connected. Newton's Law is still valid but the true expression for force is a summation of all masses multiplied by their respective accelerations.

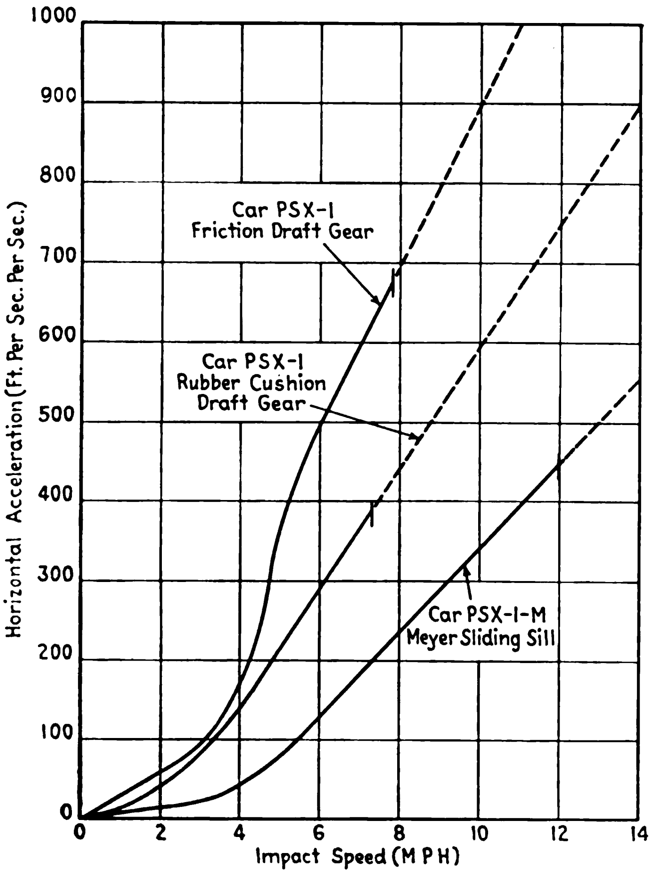
Body acceleration can be reduced by providing a more flexible connection between the body and the center sill. This will in turn reduce the force on the coupler. Flexibility between the center sill and the trucks will further reduce the coupler force due to the reaction of the trucks.

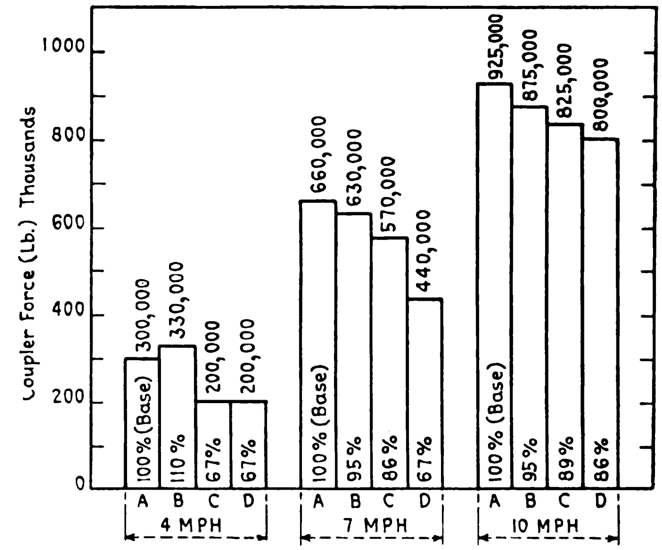
The force-time pulse which occurs during impact is equal to the transfer of momentum from the striking body to the struck body. For a given set of impact conditions, that is, given masses and given velocities, the transfer of momentum will be a constant. This is in accordance with the law of conservation of momentum which requires that the area under the force-time curve remain constant. The only way to reduce coupler force is to increase the time during which it acts. This can be done by increasing the flexibility of the complete freight car by making the structure a softer spring. The area under the force-time curve will remain constant. The coupler force for an empty box car impact can be expressed by an equation which shows that the theoretical force-time pulse is a sine wave. Experimental data on force during impact agrees very closely with the theory.



Weight of striking car, lb. 142,000
Weight of struck car, lb. 164,600

▲ **Fig. 4—The effects of various impact speeds on coupler forces with different types of cushioning equipment.**





Weight of striking car, lb. 142,000
Weight of struck car, lb. 164,600
Struck Car:
A—Car PSX-1 with friction draft gear
B—Car PSX-1 with rubber cushion draft gear
C—With conventional sliding center sill
D—Car PSX-1-M with Meyer sliding sill

Fig. 5—Bar graph showing the relative effects of four cushioning equipments on coupler forces at three speeds.

Under impact conditions generally encountered with freight cars the struck car is standing still prior to being struck. Part of the energy remains in the form of motion of the two bodies. The other part of the energy, which we choose to call "Impact Effect," is the energy which must be absorbed by the draft gear, the car structure and the lading. For the idealized case of equal car weights the energy of motion is equal to the impact effect. It is the impact effect which causes damage to the car structure and lading whenever the capacity of the cushioning devices is inadequate.

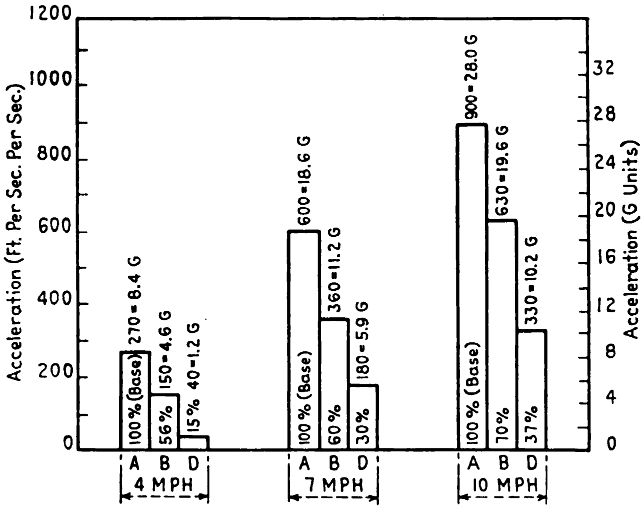
The use of the term "Impact Effect" was proposed by Wendel J. Meyer, who has been a student of the dynamics of freight car impact for about 40 years, as a means of simplifying discussions of this subject. It is suggested that the term be adopted by draft gear and car building engineers.

Fig. 4 shows some typical curves plotted from laboratory data of coupler force vs. impact speed. The conditions of test from which these data were derived were identical. It will be noticed that the characteristics of the draft gear are apparent only below speeds of 5 m.p.h. For comparative purposese, one set of tests was run without draft gear in the car. It will be seen that this curve is approximately a straight line indicating the direct relationship between force and velocity which is to be expected when impacting elastic bodies.

The values shown above 700,000-lb. coupler force have been extrapolated and are subject to question as plastic deformation can be expected to occur in car structures at these higher forces. At an impact speed of 7 m.p.h. it will be noticed that the friction draft gear exerts a force of approximately 700,000 lb. or 70,000 lb. more than the rubber cushion draft gear, 130,00 lb. more than the conventional sliding center sill underframe, and 260,000 lb.

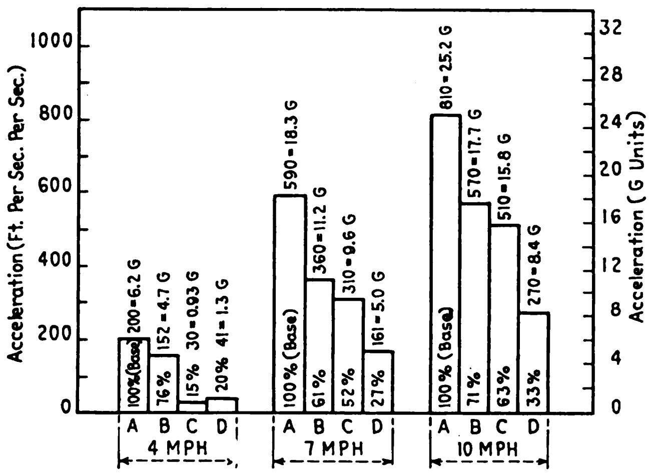
Weight of striking car, lb. 142,000
Weight of struck car, lb. 164,600

◀ **Fig. 6—Curves showing the horizontal acceleration produced by impact speeds between zero and 14 m.p.h.**



Weight of striking car, lb. 142,000
Weight of struck car, lb. 164,600
Struck Car:
A—Car PSX-1 with friction draft gear
B—Car PSX-1 with rubber cushion draft gear
D—CAR PSX-1-M with Meyer sliding sill

Fig. 7—The car horizontal acceleration with the Meyer sliding sill compared with the friction and the rubber cushion draft gears.



Weight of striking car, lb. 142,000
Weight of struck car, lb. 92,900
Struck car:
A—Car PSX-1 with friction draft gear
B—Car PSX-1 with rubber cushion draft gear
C—Conventional sliding center sill
D—Car SX-1-M with Meyer sliding sill

Fig. 8—All four cushioning devices compared at 4, 7 and 10 m.p.h. with the struck car loaded to 40 per cent of capacity.

more than the Pullman-Standard rubber cushion underframe with sliding center sill.

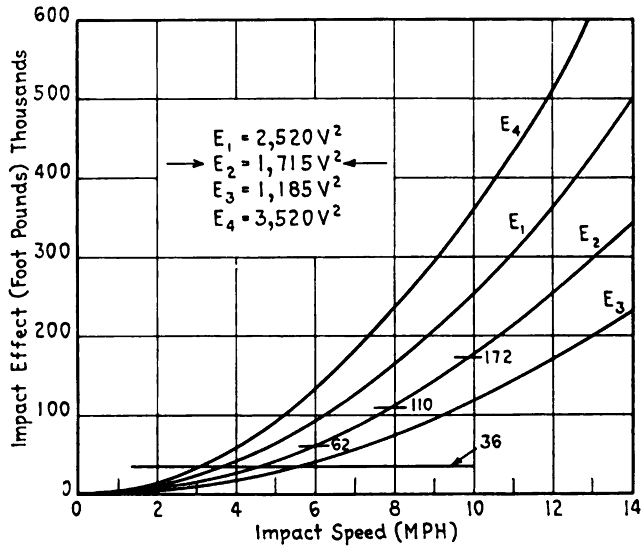
There is another way to look at these curves. If 500,000 lb. is arbitrarily used as a coupler force which will cause damage to the car strncture, it will be seen that the car without draft gear reaches 500,000 lb. at 4.2 m.p.h., the car with the friction draft gear reaches 500,000 lb. at 4.9 m.p.h., the rubber draft gear car at 55 m.p.h., the conventional sliding center sill underframe at 6.2 m.p.h. and the Pullman-Standard rubber cushion underframe at 7.6 m.p.h.

Fig. 5 shows a bar graph prepared from data taken from the curves shown on Fig. 4. Three speeds are shown for comparison: 4, 7 and 10 m.p.h. Car A is equipped with friction draft gear, B with rubber cushion draft gear, C with conventional sliding sill underframe and Car D with Pullman-Standard rubber cushion underframe. This graph gives a ready comparison of the effectiveness of the different types of draft gear in reducing the force acting on the car and lading.

Fig. 6 shows some typical curves plotted from laboratory data showing the effect of impact speed on horizontal acceleration, the factor causing damage to the lading. There is a noticeable spread between the different types of draft gears. Fig. 7 gives similar information in bar graph form. At 7 m.p.h. the car body with the friction draft gear is subjected to an acceleration of 18.6 times gravity, with the rubber cushion draft gear this acceleration is reduced to 11.2 gravity and with the Pullman-Standard rubber cushion underframe the value is 5.9 gravity.

As pointed out in the discussion of fundamentals, the acceleration of a car body is not directly proportional to the coupler force. From the data just presented on force vs. impact velocity it was noted that the rubber gear had 95 per cent of the force produced by the friction draft gear and the Pullman-Standard rubber cushion underframe had 52 per cent of the force developed by the friction gear. On the other hand, with the rubber cushion draft gear the body acceleration is only 60 per cent of the friction gear acceleration and the Pullman-Standard cushioned car is only 30 per cent of the friction gear.

The values presented for a 7 m.p.h. impact speed are



Weight of struck car, lb. .... 164,600 } E_1
Weight of striking car, lb. 142,000
Weight of struck car, lb. .... 74,100 } E_2
Weight of striking car, lb. 168,600
Weight of struck car, lb. .... 46,400 } E_3
Weight of striking car, lb. 142,000
Weight of struck car, lb. .... 210,000 } E_4
Weight of striking car, lb. 210,000

Fig. 9—Impact effect at different impact speeds with four random combinations of car loading.

important since 7 m.p.h. represents the mean speed at which cars are being impacted in classification yards. It is of further interest to note that these accelerations do not change appreciably with a change in load. Fig. 8 shows a bar graph of horizontal accelerations for a 40 per cent load condition. For a friction draft gear the acceleration is 18.3 gravity as compared with 18.6 for the fully loaded condition. For the rubber gear 11.2 as compared with 11.2, for the Pullman-Standard 5 as compared to 5.9.

From these figures it can be seen that providing adequate protection for lading raises serious problems. The package designers have made progress, but it seems almost unfair to expect that they can supply adequate

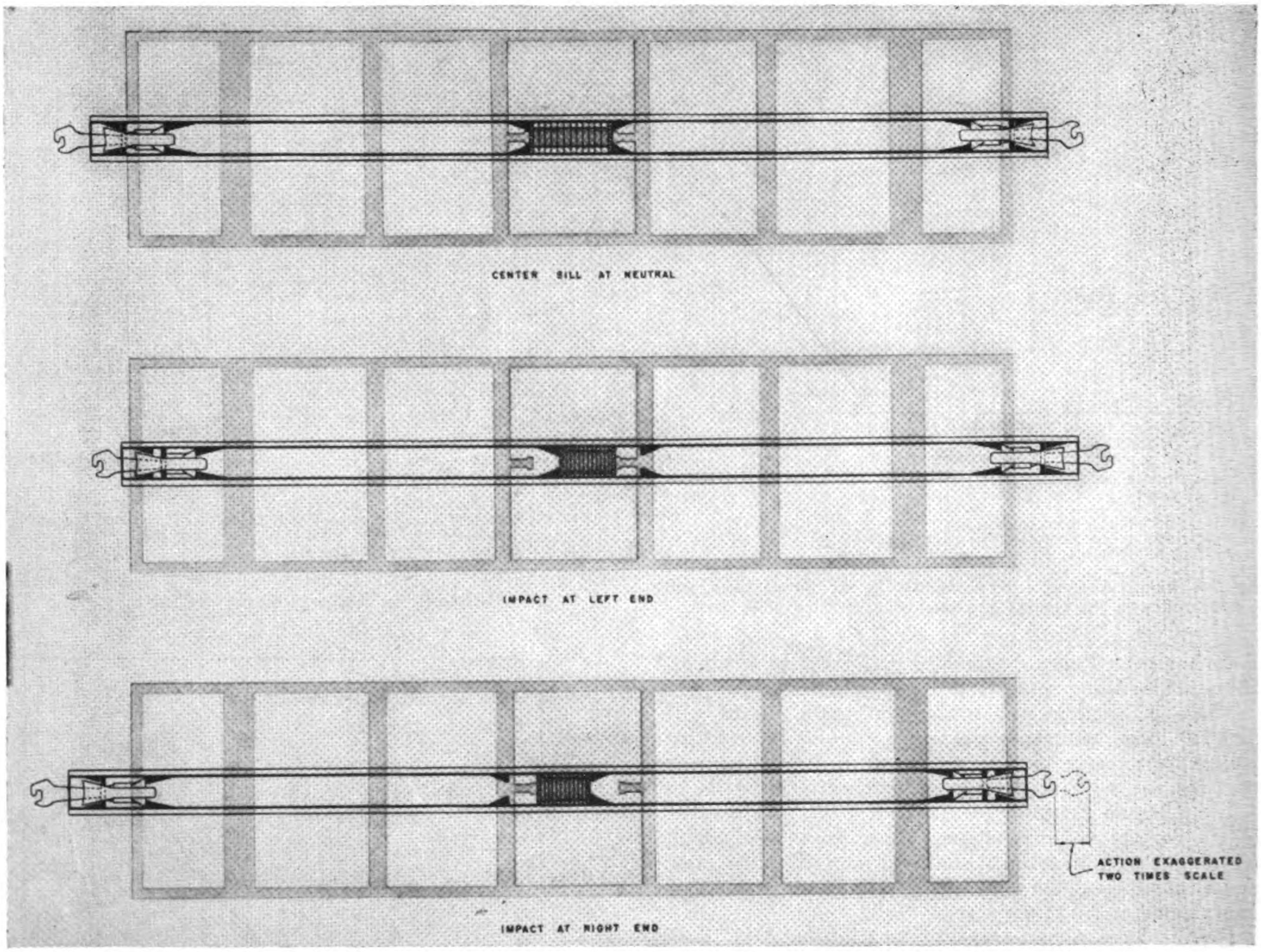


Fig. 10—The operating characteristics of the Pullman-Standard rubber cushion underframe with sliding sill

packaging for protection against the very high accelerations encountered, unless the package becomes more expensive than its contents, which means it is then economically impractical.

Fig. 9 shows curves for the impact effect vs. impact speed, impact effect being previously defined as that part of the energy which must be absorbed by the draft gear, the car structure and its lading.

From these curves it is apparent that conventional draft gears absorb only a small percentage of the energy, leaving the rest of the energy to be absorbed as best it can by the structure and lading. This absorption of energy is the principal area in which draft gear designers and car builders can contribute to the improvement of freight cars. There are of course severe limitations on what the draft gear designers can do, since the travel for draft ears today ranges from $2\frac{5}{8}$ in. to $3\frac{1}{4}$ in. The absorption of an appreciable amount of energy with this much travel requires a very high force level which in itself may be damaging to structure and lading. If freight cars are going to be impacted at speeds in excess of 5 m.p.h., and currently approximately 80 per cent of all impacts occur above this epeed, then it becomes apparent that the car builder must make his contribution to the cushioning problem and employ the principle of the sliding center sill. By means of this principle more work can be done at reasonable force levels because of the increased length of travel available.

The PS Rubber Cushion Underframe with sliding sill represents the best of several designs of freight car cushioning devices developed and tested by Pullman-Standard over the past few years. This device, illustrated in Fig. 10, appears to be most promising, both from a standpoint of its cushioning capacity and simplicity of design. The car is arranged so that the center sill slides relative to the underframe and is connected to the car body through rubber compression pads. The total travel of the sill is approximately 7 in. under an impact speed of 13 m.p.h. with a fully loaded car.

This gear never goes solid against metal but continues to compress the rubber. In addition to the cushioning between the sliding center sill and the car body, conventional draft gears are used at each end of the center sill. This feature gives protection to the center sill itself, as well as additional cushioning to the car and its lading. Fig. 11 shows the force and cushioning capacity vs. sill travel for this type of construction. It will be noted from these curves that the cushioning capacity is in excess of 120,000 ft.-lb.

The use of the rubber cushion underframe with sliding center sill also reduces vertical accelerations of the car body. Fig. 12 shows some oscillograph curves plotted for vertical acceleration vs. time at the struck end of the car and at the end opposite the struck end. It will be noted that the maximum acceleration for the standard construction is about 138 feet per second per second, whereas for

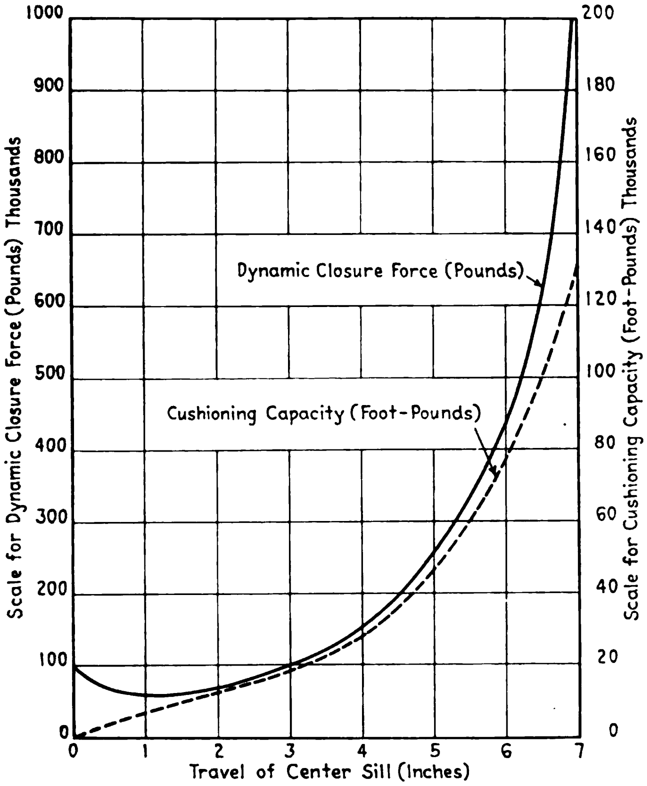


Fig. 11—Force and cushioning capacity vs. center sill travel for the PS rubber-cushion underframe with sliding sill.

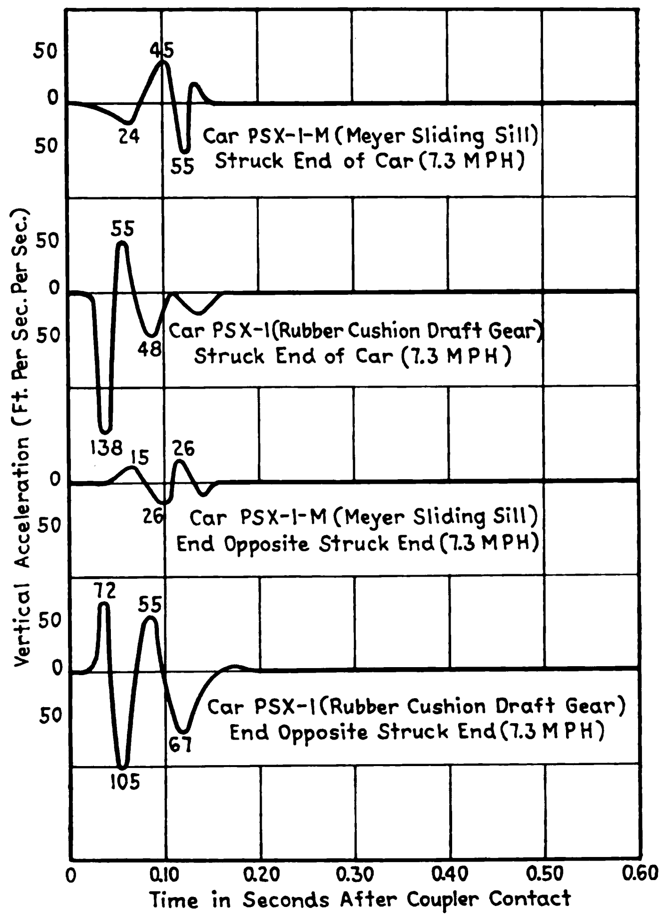


Fig. 12—Oscillograph curves of the vertical acceleration of both ends of a fully loaded struck car.

the sliding sill the maximum acceleration is 55 ft. These curves also illustrate the fact that the initial acceleration of the struck end of the car is downward whereas the acceleration on the end opposite the struck end is upward.

Railroads today are making every effort to realize higher utilization of equipment. This seems to reflect itself in higher speed operations all down the line, including impact speeds in classification yards, the mean speed according to one survey being around 7 m.p.h. As a result of these increased speeds car structures and lading are being subjected to higher forces and a requirement exists for developing better draft gears and other types of cushioning devices to protect both the car body and its contents.

Present draft gears are entirely inadequate for the amount of energy which they are required to absorb. The rubber cushion sliding center sill is a step in the right direction towards solving this problem. As long as free slack in a train, which limits draft gear travel, is a problem which must be contended with it appears that future trends will have to be along the lines of the sliding center sill car. By this means a reasonable amount of work can be obtained at a force level which will not cause damage.

There is also the possibility that hydraulics may enter the picture again although hydraulic draft gears have been tried unsuccessfully from the day of George Westinghouse up to the present time. Hydraulics offers, theoretically at least, the advantage of maintaining a constant force level throughout any given length of travel.

Adequate horizontal cushioning appears to be the main problem facing the railroads today. Some progress has already been made toward solving this problem and within the next few years further progress can be expected. Improved draft gears used in connection with the other devices should go a long way towards improving conditions throughout the railroad industry.

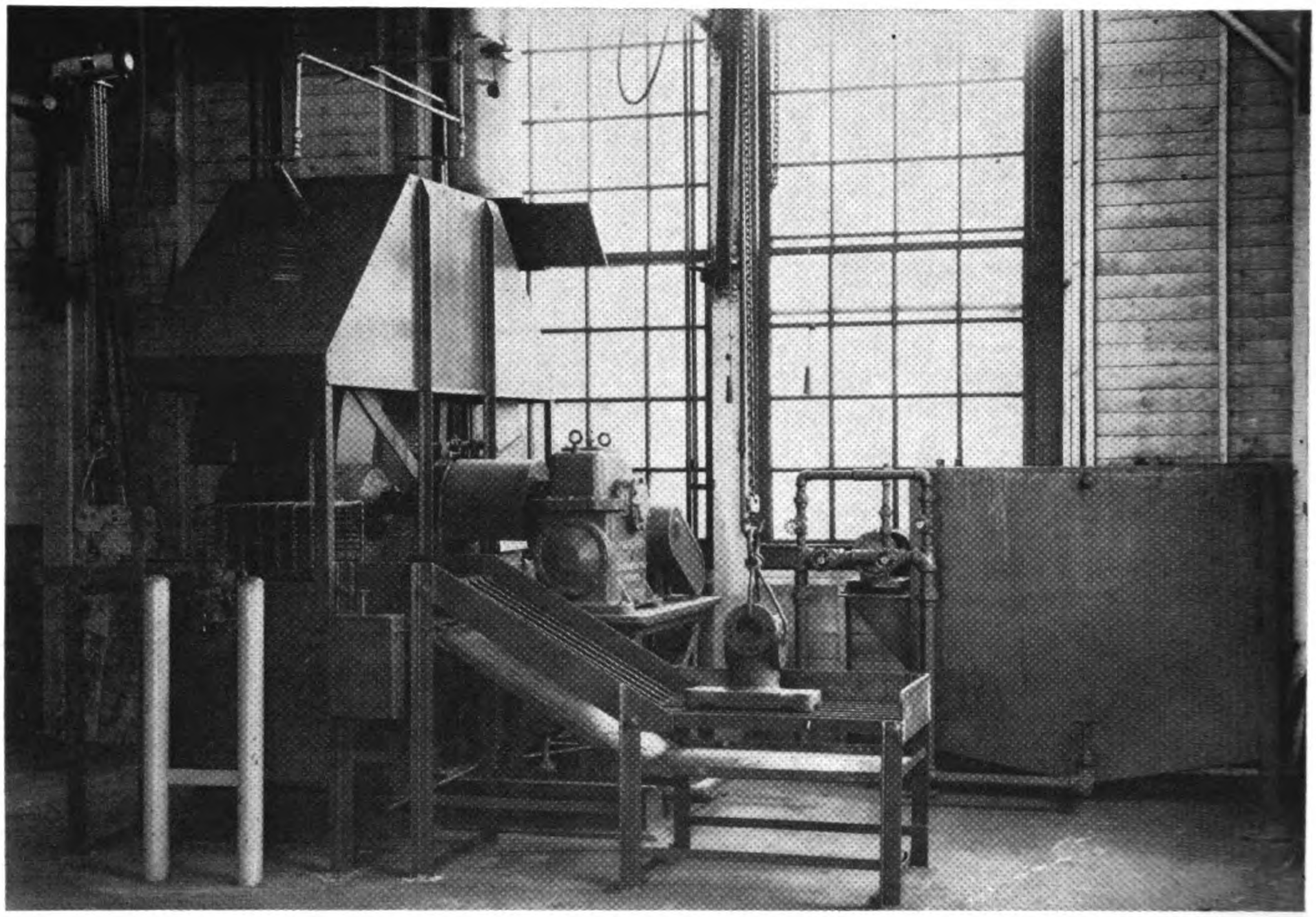
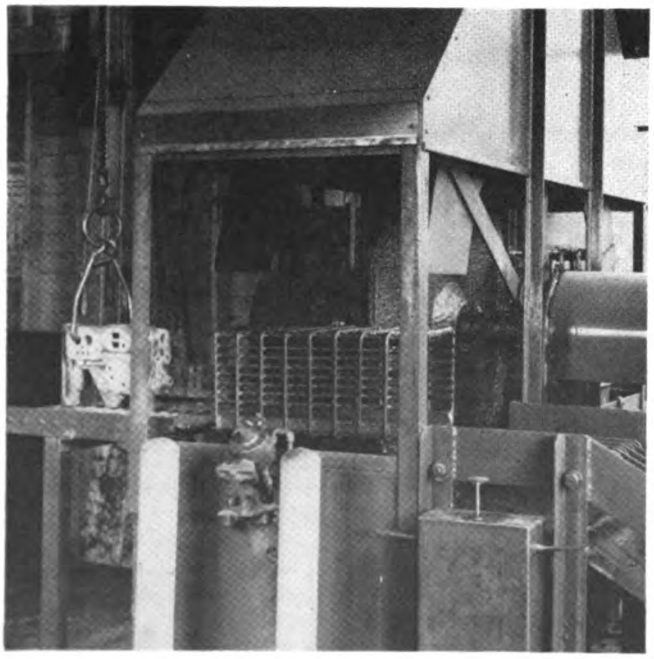


Fig. 1—Machine for dip painting castings.

Air Brake Corrosion Problems



C. E. Macfarlane
Chief Chemist, Westinghouse Air Brake Co.
Wilmerding, Pa.

In many respects air brake equipment, especially that used by railroads, is unique. In the first place the air brake is safety apparatus, it must be as foolproof as it is humanly possible to make it, and that has always been the principal aim of air brake engineers.

Air brakes are unique in the manner in which they operate. In a long freight train the rear cars may be as much as 1½ miles from the locomotive, with no mechanical linkage or electrical current to connect them. Yet, the brakes can be promptly applied or released throughout the length of the train merely by changing the air pressure in the brake pipe at the engine. In each of the cars this causes the movement of precision made parts which are sensitive to pressure changes of as little as .4 pound per sq. in. This seemingly delicate equipment travels on cars and locomotives all over the North American continent,

◄ Fig. 2—Close-up of machine showing basket for holding castings.

from Canada through the 48 states to Mexico, with the attendant extremes in climate. It is exposed on the outside to rain, snow, subzero weather, hot sunshine and all kinds of industrial atmospheres and on the inside to air carrying varying amounts of moisture, oil vapors and other contaminants. It is subjected to vibration, shocks and rough handling, but at times may stand idle for weeks or months and yet must function again perfectly when called upon, without even first being inspected. In spite of these rather severe requirements air brake equipment does not receive any attention, such as cleaning or lubricating, oftener than six months to three years, depending on the type of equipment. It is also expected to last and to perform its duties for many years.

This equipment is of necessity made mostly of metals, and most metals are subject to corrosion unless properly protected. It follows therefore that these devices must be made of carefully selected and treated materials in order to maintain the reliability of functioning and the safety standards that are expected of them.

The essential parts of this equipment consist of various control valves which are usually made mostly of cast iron, or in some cases aluminum, and which contain parts made of brass, zinc die castings, steel and plastics: of reservoirs which may be either cast iron or steel, of brake cylinders, made of cast iron and steel, and of air compressors, also made of cast iron or aluminum and steel.

The various types of valves contain the vital moving parts that control the brake functions. The frictional properties of many of these parts are important and must remain relatively constant. From an economic and production standpoint the most practical material for the valve bodies is cast iron, or for some of the newer designs aluminum die or sand castings. It has always been the practice to treat the iron castings in some manner to reduce or retard the rusting of the internal surfaces which would otherwise take place in a short time. The oldest method was to immerse the bodies after machining in molten paraffin wax. This afforded a moderate degree of protection, but the choice of paint which could be applied to the exterior over the paraffin was limited due to the solubility of paraffin in most paint thinners which prevents complete drying.

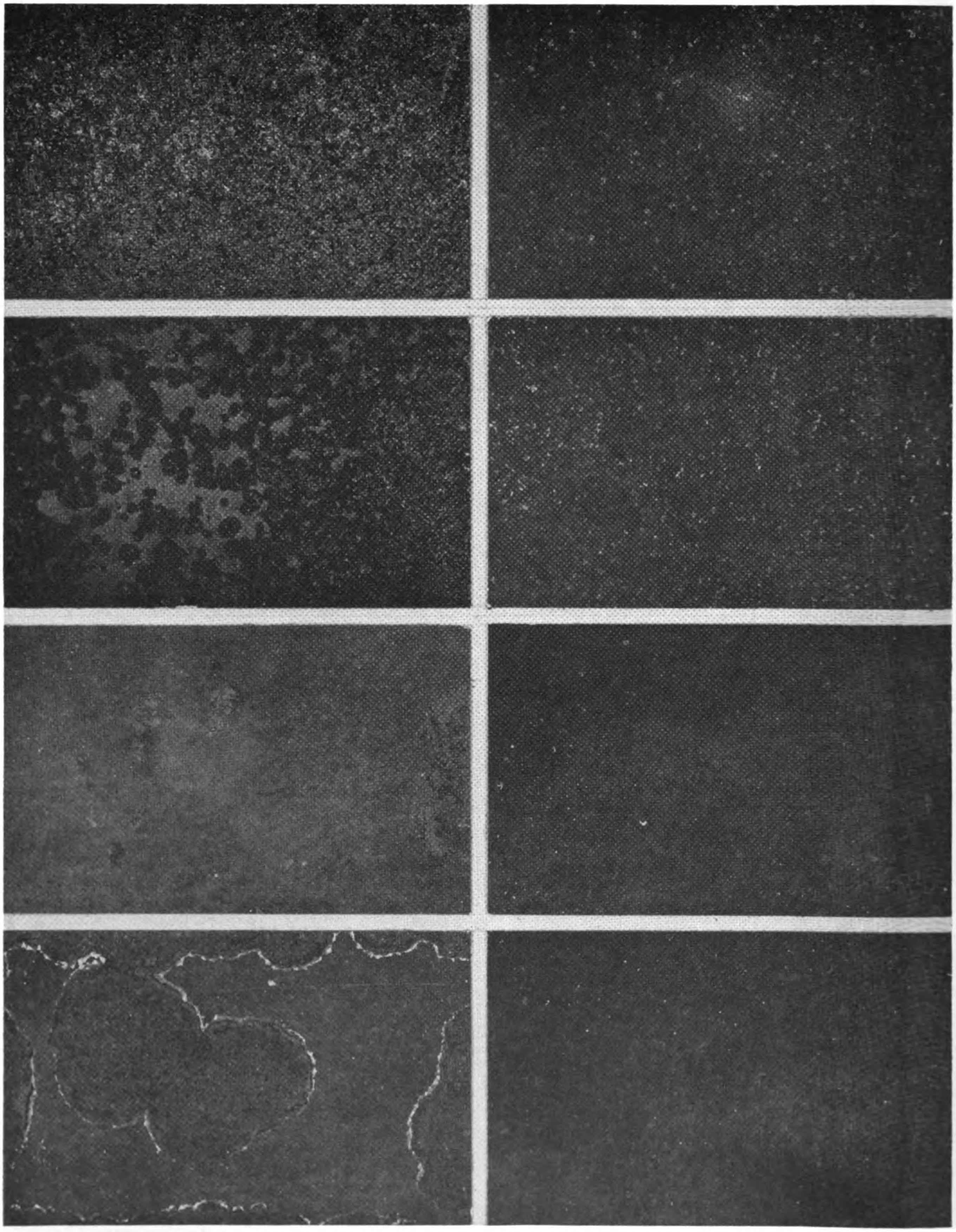
Later a large number of materials and treatments which could be applied by simple immersion was investigated for the purpose of improving both the rust resistance on the internal surfaces and the paint adherence and drying on the external surfaces. As a result of these tests a material was adopted which consisted of a harder and more insoluble wax than paraffin with the addition of some resin dissolved in an organic solvent. This treatment permitted the application of a wider range of external finishes and an aluminum paint was decided on which provides longer protection, dries more completely, acts as a better base for repainting and has a more pleasing appearance. As the brake requirements became more stringent and the functions more critical, it was desired to improve the corrosion resistance of these valve bodies still further. A paint primer, preferably applied by dipping, had been considered from time to time, but had not been adopted because it was not practical to apply paint to machined surfaces which had to be held to close tolerances. After more extensive testing, including tests on valves in actual, accelerated operation, it was decided to split the protection into two treatments, the first for unfinished surfaces, and the second for machined surfaces. The practice now in use for cast iron valve bodies and many other iron castings is to dip paint the rough castings after they are cleaned in the foundry by sand-blasting or in a molten salt. A quick drying zinc chromate-iron oxide primer is used for this purpose. This provides by far the best protection against corrosion of the internal surfaces that has been used and also has these additional advantages: it prevents rusting not only in service, but also during storage before machining, it simplifies cleaning after machining by making it easier to remove cuttings from the smoother surface, and it provides a good base for the finish paint coat which is applied to the outside of the castings. The complete removal of cuttings from the internal cores is particularly important.

The method and equipment which are used for dip painting valve bodies are rather interesting. These castings are extremely complicated cored castings and in order to cover all internal surfaces and then drain all excess primer out, it is necessary to rotate the castings through a 360-deg. circle. For this purpose our engineers designed and built several machines which resemble ferris wheels. The castings are placed in open mesh baskets and the machine is indexed to the next position, the castings moving down into the paint tank in which the paint is agitated to prevent the pigment from settling. After a controlled time interval the machine indexes again and the castings eventually are completely rotated and returned to their original loading position where they are discharged from the other end of the basket. By this means all the internal as well as the external surfaces are covered with the primer and, what is just as important, the excess is completely drained, including that from dead-end cores. At each indexing position a set of castings is discharged and a new set loaded into the empty basket. The viscosity of the primer is closely controlled and frequently checked so as to maintain the correct film thickness.

This primer remains on all unmachined surfaces but is removed during the machining of the finished surfaces. These surfaces are protected by a second dipping operation in the wax-resin solution previously referred to. This material is applied by the same type of machine as that used for the primer. It leaves a thin, smooth coat which does not cause any difficulty in obtaining air tight gasket joints on these surfaces.

Moving parts in the valves, such as pistons and slide valves, and the parts with which they are in contact, such as cylinder liners or bushings, are made of brass, molded phenolic plastic or sometimes stainless steel. It is particularly important to prevent corrosion of brass pistons with closely fitting bronze piston rings, as it takes relatively little corrosion in the ring groove to cause a ring to stick, and a stuck ring usually means faulty brake operation. A great deal of study has been devoted to this subject throughout the years. Brass containing 5 per cent or more of lead is much easier to machine than lead free brass, but it also corrodes more in moist air, forming a white deposit on the surface. We have compromised by using brass containing 2 per cent lead which reduces corrosion to a minimum, but is not too tough to machine. In addition the pistons and rings are soaked in a mixture of light oil and mineral spirits before assembly which further improves corrosion resistance.

In recent years we encountered more frequent cases of ring sticking due to corrosion of the pistons and rings in passenger brake equipment. This occurred particularly in certain locations or on certain roads. Examination of the pistons showed that in every case drops of water were present along with the oil in the ring grooves, also that the oil did not consist of the triple valve oil alone, but had been contaminated with other oil. It was also found



Eight steel panels after five years' outdoor exposure. The left hand group above are all carbon steel, the right hand group, alloy steel. The right- and left hand-panels, from top to bottom of page are, respectively: plain bars with no coating; with petrolatum coating; with Japan A coating and, bottom pair, with Japan B coating.

that more than average amounts of water were passing through the brake pipe in these trains. We then checked the condensed water drained from the reservoirs and the used compressor crankcase oil and found a distinct acid condition in both, enough to cause corrosion of brass. This corrosion was taking place because of excessive amounts of contaminated water and oil passing through the brake pipe and into the valves due to insufficient cooling of the compressed air. Every effort was made to have this condition corrected at the source, but this could not be completely accomplished and it was necessary to take other steps to prevent the corrosion in the ring grooves. It was possible to reproduce the ring sticking in laboratory tests by placing a few drops of the acidic reservoir drainings in the ring grooves of brass pistons, along with the oil and letting the pistons and rings stand for several days. Once every day the pistons were immersed in tap water for several minutes and every day a test was made to determine whether or not the ring was stuck. This accelerated treatment produced stuck rings in six days when pistons containing 6 per cent lead were used lubricated with standard triple valve oil, which is a straight mineral oil of SAE 20 viscosity. A number of different brass and bronze compositions were tried out for the pistons and several types of lubricants were used in these tests, including dry lubricants. With a combination of a 2 per cent lead brass piston and a soap thickened oil as a lubricant in the ring groove, the time required to produce enough corrosion products to cause ring sticking was extended to about 30 days. The new oil has the advantage of better adherence to metal and greater water repellency and thus is effective in retarding corrosion. The laboratory results were confirmed in additional tests which were conducted in complete valves operated with air, using the same piston materials and lubricants. In these tests it took a longer time to obtain ring sticking, and with the best combination of materials the test was finally discontinued without obtaining sticking. The low lead brass is now standard and the special oil is on service test, and according to reports received so far this trouble appears to have been overcome.

Quite a number of small steel springs are used in the valves, and again rusting must be avoided. Many years ago they were nickel plated, but that was in the days when nickel plating practices were not as good as they are today. Pin holes in the plating caused rusting and resulted in short life of the springs, especially if the equipment was exposed for any length of time to corrosive tunnel atmospheres. A thorough investigation of various plated coatings was undertaken and a change to cadmium was made with very satisfactory results. During periods of cadmium shortage it has been necessary to use zinc plating, with a dichromate finish, but we still prefer cadmium. Some of the smaller springs are made of stainless steel.

In addition to these metals aluminum alloys, mostly in the form of castings, and zinc die castings are used in many of the valves. These metals also form objectionable corrosion products when attacked by moist air unless they are protected in some manner. We have found that treatments in a sodium carbonate-potassium dichromate solution for aluminum, and a phosphate solution for zinc, provide both corrosion protection for the internal surfaces and better paint adherence for the external surfaces. Some difficulty has been encountered with corrosion of zinc die castings because of brine drippings on refrigerator cars. This could be prevented or reduced by a better external finish. But due to the interchange of valve portions from one car to another it would not be economical to apply a considerably more expensive finish to all valves to protect the relatively few which are subjected to brine.

Reservoirs for storing compressed air on locomotives, passenger cars and some freight cars are made of steel. These pressure vessels which are designed for a life of many years, are exposed to corrosive conditions both on the outside and the inside. To avoid excessive weight the thickness of steel required for each size of reservoir is carefully calculated and the necessary factor of safety and allowance for corrosion added. Our standard protection for main reservoirs for locomotives made of carbon steel consists of two coats of baked black Japan on the inside and outside. Up until about 5 years ago the Japan we used would not resist hot alkali and the railroads were warned not to use alkaline cleaning solutions to remove oil from the inside of reservoirs.

In spite of the best intentions this sometimes happened and after several such cleaning operations the Japan was stripped off and was not replaced, which eventually resulted in trouble. In response to demands for an alkali resistant protection a large number of coatings of different types, including the newer synthetics, were tested in the laboratory. One paint manufacturer came up with a Japan which effectively resists a boiling 4 oz. per gallon sodium hydroxide solution for 36 hours. This is the material which is now used on reservoirs.

Other reservoirs in less severe service are coated on the inside with an inhibited petrolatum type of material and on the outside with black paint. The inside coating has a melting point of 155 deg. F. and is therefore not used where the reservoirs are exposed to heat.

When the low alloy high tensile sheet steels containing copper, nickel or chromium became available, they were thoroughly investigated for use in reservoirs. It was soon found that these steels could not be successfully used without internal protective coatings, as the rate of corrosion in moist air is not sufficiently slower than that of carbon steel to offset the omission of the protective coating. However, laboratory and outdoor exposure tests of panels of plain carbon and low alloy high tensile steels which have been conducted for several years have demonstrated the value of the low alloy steels when they are used in combination with protective coatings. Fig. 3 shows the appearance of these panels after about 5 years outdoor exposure in the industrial atmosphere of Western Penna. It is obvious that the effective life of the low alloy steel with a given protective coating is much longer than the life of plain carbon steel with the same protective coating. While the rate of moisture penetration through the coating is undoubtedly the same in both cases it is probable that the type of oxide formed on the plain carbon steel has a tendency to lift the coating and permit additional corrosion to take place whereas the oxide on the low alloy steel has less volume and permits the protective coating to retain its effectiveness to a greater degree. We believe that the real value of the low alloy steels lies in their application in conjunction with a protective coating, and it is in this manner that we are utilizing them in air brake reservoirs. Due to their better corrosion resistance and higher strength it is possible to use a lighter gage sheet and therefore save weight.

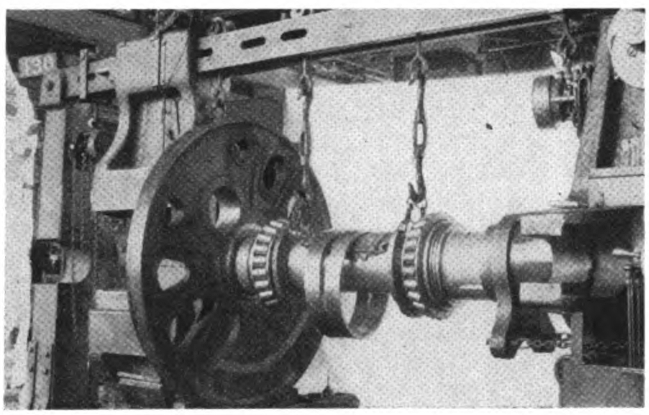
Brake cylinders are more rugged devices than the control valves, but they are often stored outdoors for some length of time and it is difficult to prevent water from entering them. Rusting of the cast iron cylinder walls and the steel hollow rods should be prevented to insure proper functioning of the cylinder and long life of its parts. The grease applied to the cylinder walls for lubrication is sufficient to protect them. Formerly the other cast iron parts were left unprotected and the steel parts were

greased or oiled. According to present standards these treatments did not produce entirely satisfactory results, and several series of tests were made with a view toward improving this condition. These tests included laboratory water spray tests and both still and operating outdoor exposure tests of brake cylinders. The materials tested for the various parts included paints, primers, lacquers, oils, waxes and several proprietary rust preventives. As a result of these tests the pistons, pressure and non-pressure heads are now painted with a primer and the springs and hollow rods are given a wax treatment.

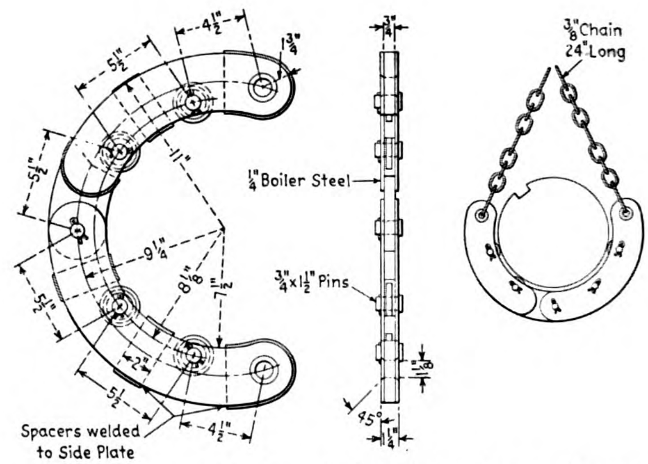
Air compressors constitute another important part of air brake equipment. Most of the internal surfaces are bathed in oil, so that corrosion is not much of a problem. Nevertheless, many of these parts are painted with a primer because it makes cleaning after machining more efficient. However some parts, such as valves, valve springs, seats and cages, are subject to troublesome corrosion from condensed moisture unless proper precautions are taken. This corrosion is most likely to take place after assembly and testing of the compressors, while they are in storage, but also on parts before assembly. The valves and valve springs are made of stainless steel. Corrosion of the other parts before assembly can be prevented by dipping in a thin petroleum product which will mix with the lubricating oil used during the compressor test. Corrosion during the later stages is more difficult to counteract. We have found that the most effective method is to drop some oil containing corrosion inhibitors into the air intake during the last stage of the running test or to pour some of this oil into the valve chambers immediately after conclusion of the test.

In our corrosion investigations we have found various types of tests useful. We generally start with accelerated laboratory tests which may consist of water spray tests or immersion tests, judging the results by appearance, weight loss or sometimes tensile tests. We prefer the water spray over the salt spray test, as we believe that it more nearly represents the service conditions that are encountered. Outdoor exposure tests on panels, actual parts or complete devices usually follow the preliminary laboratory tests, but whenever possible the final appraisal is based on an outdoor operating test of the equipment or on actual service experience. In this respect the co-operation of the railroads has been very helpful.

Over the years the operating requirements of air brake equipment have become increasingly severe and at the same time there has been a demand to lengthen the time between cleaning and repair operations. Hence, a continually greater need to prevent corrosion and keep the equipment clean has been felt. Fortunately there have also been favorable developments in materials, both base materials and protective coatings. It is our aim to take advantage of this progress and to apply the results whenever it is feasible, in order to keep pace with the ever increasing demands.



A pair of roller-type slings used to support driving axles at wheel press prior to application of the driving wheel



Details of roller-type axle sling which facilitates key way alinement preparatory to pressing on driving wheels

Roller-Type Axle Sling

The roller-type sling, illustrated, is used to hold driving axles at the wheel press and permit easy rotation until key ways are in alinement prior to pressing on the driving wheels. This sling consists of two pairs of side plates, separated 3/4 in. by suitable spacers and joined by a hinged connection at the center to adapt the sling to axles of different size. The sling carries four 2 1/2-in. rollers supported on 3/4-in. by 1 1/2-in. pins which extend through the side plates and are held by cotters as shown in the drawing. The sling is completed by applying two short lengths of 3/8-in. chain with rings in each end for attachment to the turnbuckles and hooks and used to support the axle from the upper bar of the 600-ton press and permit necessary fine adjustments vertically for alinement with the wheel-center bore.

This is the kind of job which can be done with make-shift "bull strength," but especially-designed equipment such as the axle sling, illustrated, permit doing the work much more quickly, easily and safely. Note that the outer roller bearing races are supported on canvass at the axle center to prevent scratching or marring either, and similar care is used in all details of putting these large roller bearing assemblies in place on the locomotive driving wheels.

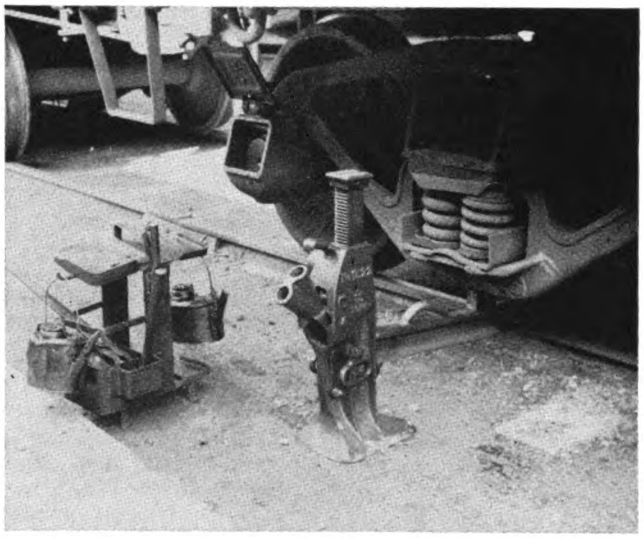
Packing Boxes and Replacing Brasses

Each side of a freight car truck need be jacked only once to repack both boxes or to replace both brasses with the method used by the Chesapeake & Ohio at Saginaw, Mich. The method employs a 15-ton jack and a section of rail 3 in. high and 29 in. long blocked as shown in the illustration.

Both sides of the truck are jacked up together to avoid any binding of the truck sides. The end of the rail away from the jack is the fulcrum, and the lifting force is applied to the side frame at an intermediate point along the length of the rail a short distance inside of the fulcrum point. In this way a high leverage ratio is attained for smooth easy raising. Different size blocks for transmitting the force are used between the rail and the bottom of the side frame to accommodate different designs of side frames.

The rail has a ½-in. hole in the bottom of the jack end. This mates with a short length of rod welded to the toe of the jack and prevents slippage. The rail is carried by the handle on top, which is made of 1-in. rod.

The small stand at the left of the jack in the picture carries essential supplies. The top holds the wedge on the right and the brass on the left, the latter having a wood lining to protect the brass. The can on the left contains car oil, that on the right a mixture of car oil and graphite to lubricate the top of the wedge. The tongs to remove the wedge and brass are offset to go around the collar. Other necessary tools frequently used, such as a hammer, a chisel to clean up the brasses, gage, etc., are also carried on the stand.



How to change brasses or repack both boxes while only jacking up the side of the truck once

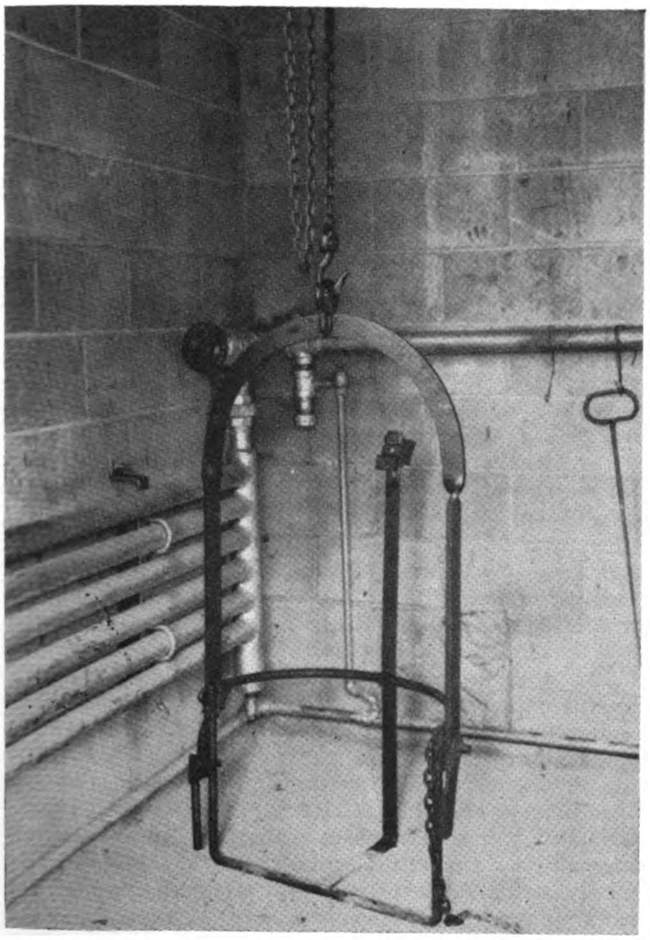
Easy Way To Handle Oil Drums

With a barrel lifter used at the Grand Rapids shops, Pere Marquette District of the Chesapeake & Ohio, drums of oil are lifted and emptied far more safely and easily than by hand. The drum is tilted sufficiently to lift it onto the base of the lifter, where it is secured by the chain. A short channel section on the near side of the rear upright member holds the drum securely along the top flange.

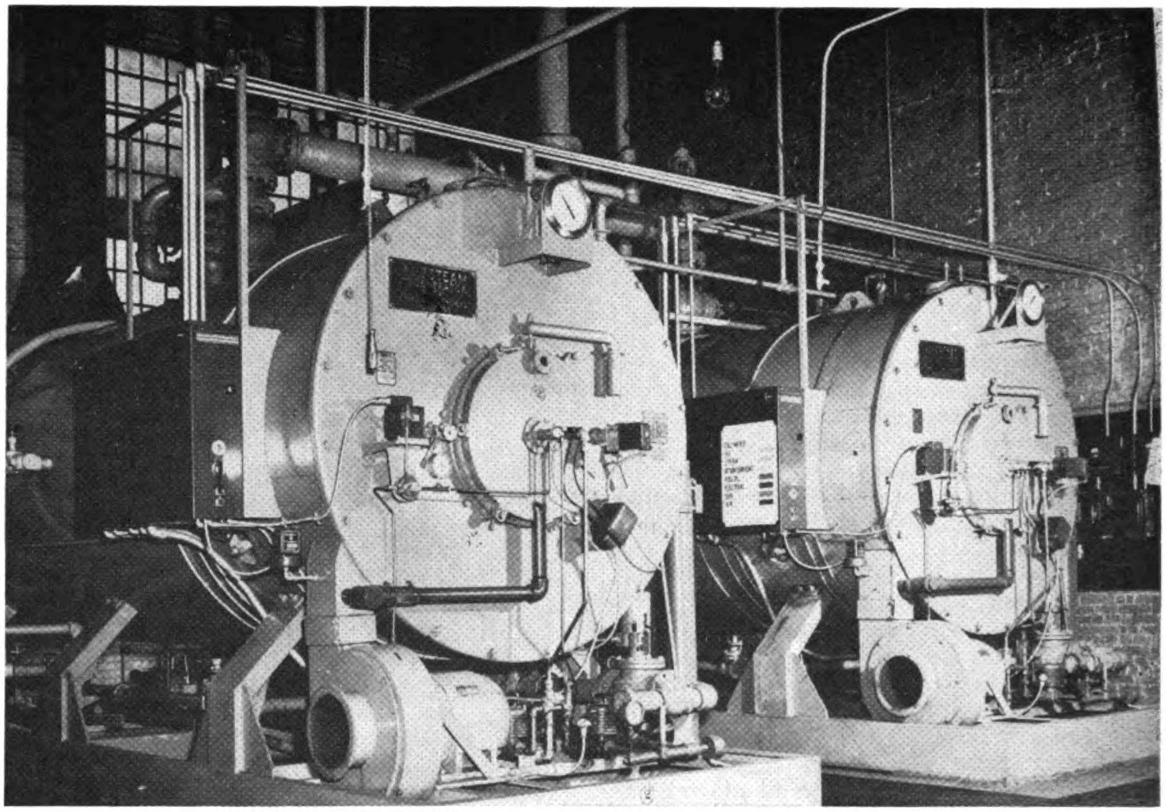
The lifter is divided functionally into two sections. The top, horseshoe-shaped half extends down to about half-way between the two pins and the floor. The lower half comprises the base, the semi-circular mid-height support for the drum, and the rear upright. This lower half pivots about the two pins which are located about a third of the way up from the floor to the top of the overall device.

The illustration shows the bottom of the lower half in the extreme forward position, which is employed for lifting and carrying the drum. This can be tilted in one direction only (toward the background) for emptying the drums. Restraint of movement in the other direction is provided by the flanged extremities of the upper half.

The upper section is made of strap iron ½ in. by 2 in. The lower half is a round rod section ⅞ in. in diameter. The rear support is ⅜ in. by 1½ in. in cross section. The two halves are welded together.



Oil drums are lifted, carried and emptied easier, and far more safely, with this device.



Two 8,625-lb.-per-hr. Amesteam generators at Louisville.

K. & I. T. Boiler Installation Saves $15,000 a Year

THE automatic boilers built by the Ames Iron Works of Oswego, N.Y., and marketed through Railroad Supply & Equipment, Inc., Scranton, Pa., have affected savings in the Louisville engine terminal of the Kentucky & Indiana Terminal. If present annual savings are continued, these boilers should pay for themselves in about three years. Each boiler has a normal rating of 250 hp. at 200 p.s.i., generating 8,625 lb. of steam per hour with a total heat output of 8,375,000 B.t.u. per hour. These boilers operate either on Bunker C oil or gas and because of their automatic features require no attendant.

The installation of the boilers and compressors was completed March 27, 1951, at a total cost of $62,492. Of this $49,899 was psent installing the two boilers, and $12,593 for the two air compressors. The net cost of the new installation to the K.&I.T. was $52,492, the saving of $10,000 being realized from the sale of the existing boilers and air compressors. The two steam-driven air compressors were sold to another railroad for $8,500 and the old boiler equipment was sold to a junk dealer for $1,500, with the dealer tearing down the old equipment, carting it away and cleaning up the room.

The principal demand for steam from the boilers is to supply heat to twelve stalls of a steam-locomotive roundhouse; a diesel house occupying six additional stalls of the roundhouse; a machine shop building approximately 50 ft. by 200 ft.; a steam-locomotive boiler shop 100 ft. square; a two-story storeroom 50 ft. by 150 ft.; an average of 35 to 40 passenger cars in the yard and four small buildings in the shop area.

In addition to heating the various buildings the steam from the boiler plant is also used for such miscellaneous purposes as supplying eight 1-in. blower lines for drafting steam locomotives, heating water for steam-locomotive boiler washing, supplying two steam jennys for washing diesel locomotives, and for heating the solution in two lye vats for cleaning air-brake materials, steam-locomotive parts, diesel-locomotive filters, etc.

The steam demand on the boilers is somewhat high because of the large distances over which it must be transmitted to supply the passenger-car storage track and the various buildings. The supply line is over 3,500 ft. long and about one-third of it is out of doors. Normally both boilers must be kept in operation during the winter, while one boiler is sufficient to meet the demand in the spring, summer and fall.

The overall savings realized with the new boilers over the old conventional type stoker-fed installation is estimated to run between $15,000 and $20,000 per year in addition to absorbing the increases in the price of fuels. Comparative costs of operating the power plant to supply steam and shop air for two identical ten-

month periods, one immediately preceeding the new boiler installation and the second immediately following it, were $47,494 for the first period and $34,312 for the second period. This saving of $13,182 is in operating cost alone for the ten-month period, or $15,818 per year.

From April 1950 to April 1951 the cost of operating the power plant was $51,216; from April 1951 to April 1952 it was $39,670, a saving of $11,546 over the last year with the old boilers and air compressors. However, future savings should amount to substantially more because the use of gas was not begun until August 20, 1951, and it had to be discontinued November 1, 1951, because of an early spell of severe cold weather. The gas is approximately one-third cheaper per B.t.u. than the Bunker C oil, and will be used in the future for about 9½ months of the year.

The principal savings from the boilers result from improved efficiency and the elimination of attendants.

Two secondary savings are, first, in per diem on coal-hauling cars, estimated at roughly $2,700 per year, and, second, the saving in storing and handling coal to protect against coal miners' strikes.

The saving in labor amounts to $9,000 to $10,000 per year, figured at the labor rate in effect prior to the installation of the new boilers. This would be increased about 15 per cent if the comparison were made using the labor rate currently in effect.

To operate the old boilers required a force of one stationary engineer at $275 per month and four stationary firemen, including one relief, at $1.33 per hour (present rate $1.51 per hour). Throughout the period of a year an average of two stationary firemen were required in addition to an engineer—three in severe cold weather; only one during the summer.

While the boilers can operate equally well from a combustion standpoint on either gas or Bunker C oil, gas is the preferred fuel because it is 15 cents cheaper per million B.t.u. than oil. However, because of insufficient capacity on the part of the public utility, the boilers are expected to be operated on gas only from March 1 to December 15. Bunker C is used during the winter months.

The cost per million B.t.u. with gas is 34.3 cents. Bunker C oil at 7½ cents per gallon runs 49.3 cents per million B.t.u. The coal used to fire the old boilers cost $6.67 per ton excluding handling and local transportation charges. With a heating value of 12,000 B.t.u. per pound, the cost per million B.t.u. with coal was 27.8 cents, but this did not include per diem charges on coal-carrying cars, cost of coal or cost of removing ashes.

Each Ames boiler has an overall length of 236¼ in., an overall width of 101¼ in. and a height to the main steam outlet of 109½ in. The weight of the boiler packed for domestic shipment is 26,800 lb., and the amount of water contained to the normal water line is 15,010 lb. The main steam outlet is 6 in. in diameter, and recommended diameter for stack 20 in. The full load firing rate with Bunker C oil is 69 gal. per hr.

The standard unit as delivered is complete and ready for installation on the boiler room floor, and ready for operation when connected to the customer's steam, water, fuel and electric lines and to the stack. The only foundation required is a level floor of sufficient thickness and capacity to carry load; no foundation bolts are needed.

Natural draft is not required for proper operation. The stack or vent need only to clear the roof top of the boiler room and any immediately adjacent building.

The boiler shell has only three passes of the combustion gases but because of the method of combustion employed, termed cyclonic, the exhaust gas temperature is held to not more than 150 deg. above the temperature of the steam in the unit. The guaranteed combined thermal efficiency is over 80 per cent.

The cyclonic method of combustion provides a gas travel through the boiler equivalent to 38 passes the length of the shell. The cyclonic combustion is achieved by introducing air tangentially from a preheating air ring in the front gas chamber of the boiler to the combustion chamber at a speed exceeding 200 m.p.h. The flame is fired into the center of the cyclone of air, allowing the rapidly rotating air stream to pick up the flame and to mix thoroughly the carbon particles of fuel with the oxygen in the air.

The positive air pressure in the combustion chamber where the fuel is fired is a minimum of 20 in. of static water pressure to aid in maintaining the cyclonic motion of combustion gases throughout the entire length of the furnace tube. The velocity of the air travel forced centrifugally creates a protective film of air between the heating surface of the furnace and the flame, thus preventing flame impingement on the heating surface and reducing the formation of carbon soot deposits.

The boiler is made so that both the water and the fire sides of the furnace and the tubes are accessible: the unit need only be off the line a short period for cleaning or inspection. The fire side is cleaned from the rear by removing a flue cover and a one-piece baffle which exposes the ends of the furnace and all tubes. Soot can be scraped toward the front and removed, without opening the front flue cover, through cleanout and inspection doors in the sides and the bottom of the front shell extension.

Room, however, must be allowed at one end of the unit for possible tube replacement. If allowed at rear, space may be used for both tube replacement and cleaning.

Internal water surfaces are accessible through five handhole openings 3½ in. by 4 in. and a manhole opening 11 in. by 15 in.

Commercially dry steam at operating pressure can be produced from a cold start in 20 to 30 minutes. An electric preheater raises the oil to proper combustion temperature when starting cold and keeps it there. This electric preheater cuts off automatically and a steam preheater takes over when the steam reaches approximately a 25-lb. pressure.

In the event of low water the unit is shut down completely and will not resume operations until the low water condition is corrected and the low-water relay button is reset manually. The electrode-type low-water cutoff which shuts down the unit in the event of low water is actuated directly by the water in the unit. If water is not sufficiently high to contact the bottom end of the electrode, the electrical contact is broken, shutting down the unit.

The pump control is also of the electrode type, and it is mounted in the water column. It comprises two electrodes spaced about 1 in. apart and connected to the feed-pump motor starter through its relay. When water leaves the end of the lower electrode, the feed pump is started automatically. It operates until water makes contact with the upper electrode, when it automatically stops.

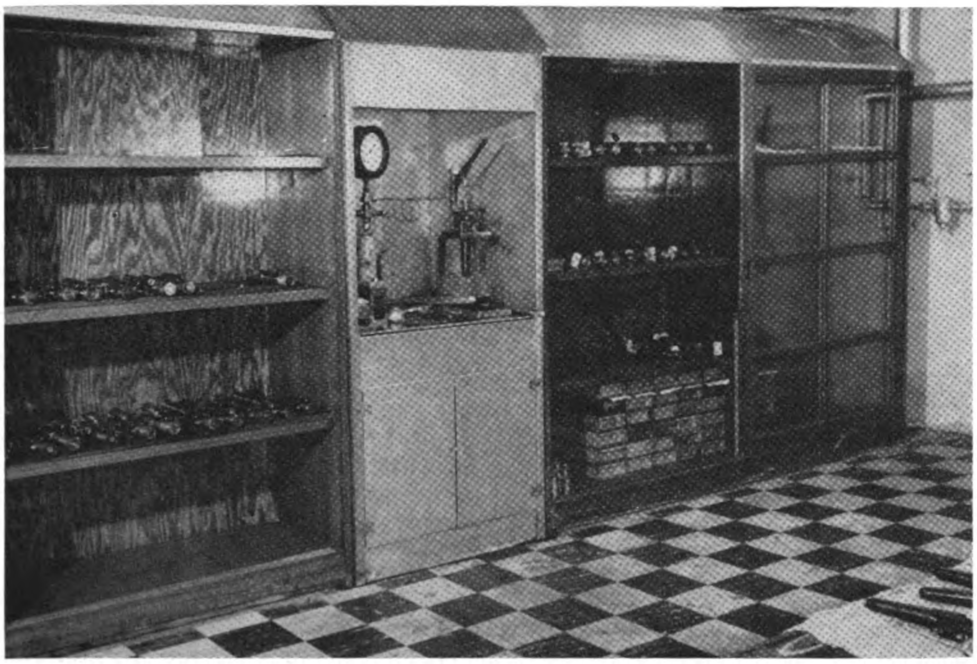
Modulated burner operation is standard and is fully automatic. The modulating motor, fuel regulating valve and air regulating dampers are mounted on the front flue cover, while the modulating pressure control is in the panel box. The modulated burner provides fuel and air in the correct proportion to the steam demand at any point within the modulating range, which is the high-output range of operation. Below the standard modulating range the operation is on—off.

Injector and Governor Repair Room

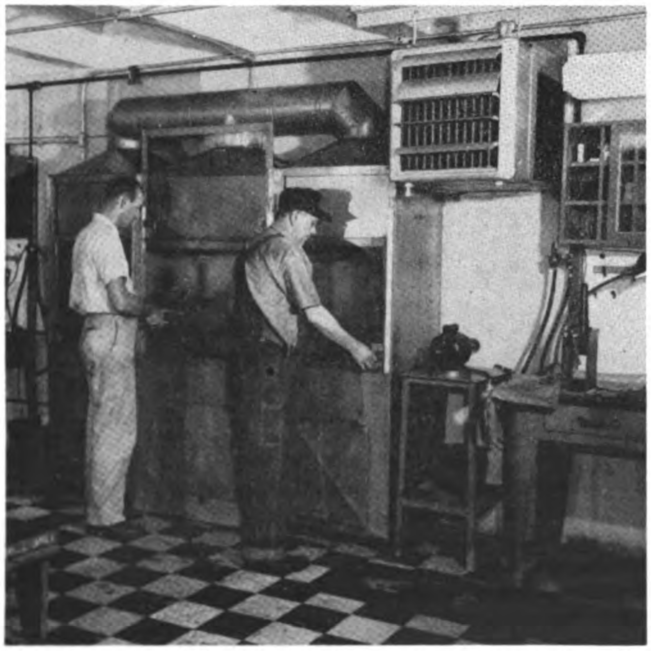
A separate room 16½ ft. wide by 26 ft. long by 10 ft. high has been equipped for the inspection and repair of diesel engine injector nozzles and governors at the Chattanooga, Tenn., shops of the Southern. The room is equipped with test racks for injector nozzles and governors, glass storage cabinets, a work bench for injector nozzles, a power grinder and a motor-driven combination wire brush cleaner and buffer. The work bench for injector nozzles is fitted with the necessary drawers for small tools and air hoses for blowing parts dry. The combination cleaner and buffer is enclosed in a glass and sheet metal cabinet fitted with an exhaust fan to remove the dust. The same fan is also connected to two enclosed cabinets on either side of the buffer and cleaner. These cabinets contain the cleaning fluid tanks. Close visual inspection of small parts is made with a magnifying glass and fluorescent lighting.

After an injector has run its term of service it is brought into the reconditioning room and put on the pop tester. If it pops at 1,000 lb. per sq. in. or more, and if in the leakage test it drops less than 600 lb. in 50 seconds, it is merely cleaned and returned to service.

Approximately 90 per cent of the injectors, however, require a complete overhaul. These are dismantled in a special device with an opening specially shaped to fit the injector body. After dismantling, the injector parts are set in cold Turco solution for eight hours. After the



The pop tester and the glass-enclosed storage cabinets on one side of the repair room.



The cleaner and buffer is served by an exhaust fan which is also connected to the cleaning fluid tanks.

eight hour soaking in the non-agitated solution, the parts are transferred to an air agitated solution of mineral spirits for an additional eight hours soaking. There are two tanks for each solution. A small basket holds all parts of one complete injector for immersion in the cleaning solution. The parts are blown off with compressed air after the mineral spirits cleaning.

Lapping operations are performed on 13 faces, and one joint is ground with an electric-motor-driven grinder with a swinging base. The lapping plates contain both medium and fine carborundum on each plate and are reconditioned each week. The check valve ball joint is ground on the motor-driven grinder. If it is in bad shape the grinding is done in two steps, using medium carborundum for the first step and fine for the second; otherwise one step with the fine compound is all that is needed.

All parts are washed with fuel oil during assembly to remove any dirt or lint and to lubricate the various parts of the injector. The check valve spring, the ring seal and filters are always renewed. After assembly the injectors are given a final pop test and a leakage test. Normally the reconditioned injectors pop between 1,500 and 1,700 lb. per sq. in. and leak from 200 to 400 lb. in 50 seconds. The injectors are stored in small metal boxes for shipment after squirting rust preventative inside. The top is pro-

tected by a thin cylinder of sheet metal, and a wooden block fits over the fuel oil connection stud to protect fuel oil openings. Air in the room is under slight pressure.

Box-Car Door Hanging Made Easy

The Grand Rapids shop forces of the Pere Marquette District of the Chesapeake & Ohio have built a light, easily moved stand which greatly simplifies the renewal of bottom-door casting pins and rollers or castings. It eliminates completely the need for horses and blocks, while securely holding the door out of the way for replacing the rollers or hangers.

The stand rests on a base made of four $\frac{1}{8}$-in. steel plates 6 in. by 20 in. The upright is welded to these plates and to four braces $\frac{1}{4}$ in. by $1\frac{1}{2}$ in. by 12 in. The bottom part of the upright is of 2-in. tubing and the top section, which telescopes into it, is of $2\frac{1}{2}$-in. tubing. The horizontal member extending from the top tubing is a T-section 22 in. long. The T-section is built up from a horizontal strap 2 in. wide and a vertical strap $1\frac{1}{2}$ in. wide: both $\frac{1}{4}$ in. thick. The end is shaped to fit under the door track. The stand is adjustable in height from $38\frac{1}{2}$ in. to 47 in. If greater height is needed, it can be blocked up easily.

The first step in the use of this stand is to burn out a notch in the door track somewhat larger than the door roller casting as shown in Fig. 2. This allows the end of the T-section of the stand to slip under the door track, and the door roller casting to slide out and rest on the T-section. The edge of the door is pulled out as far as desired, and, while supported vertically by the T-section, is prevented from going back in by inserting the pin on the end of the chain in one of nine holes in the top of the T-section of the stand as shown in Fig. 3. The door is thus securely supported and at the same time completely out of the way for the renewal operations.

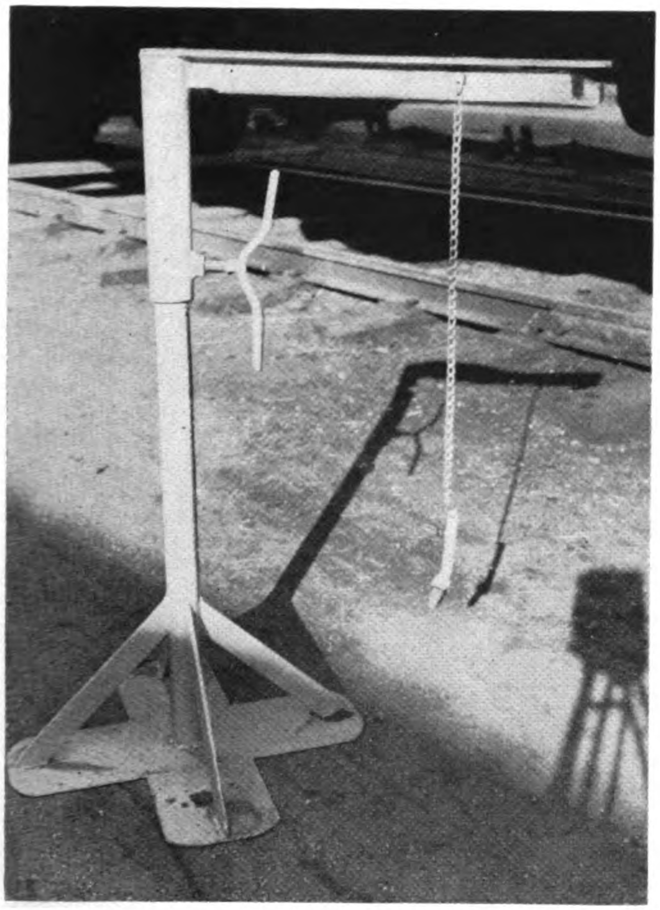


Fig. 1—General construction of the door stand showing the slot at the extreme right in the top member for slipping under the door track.

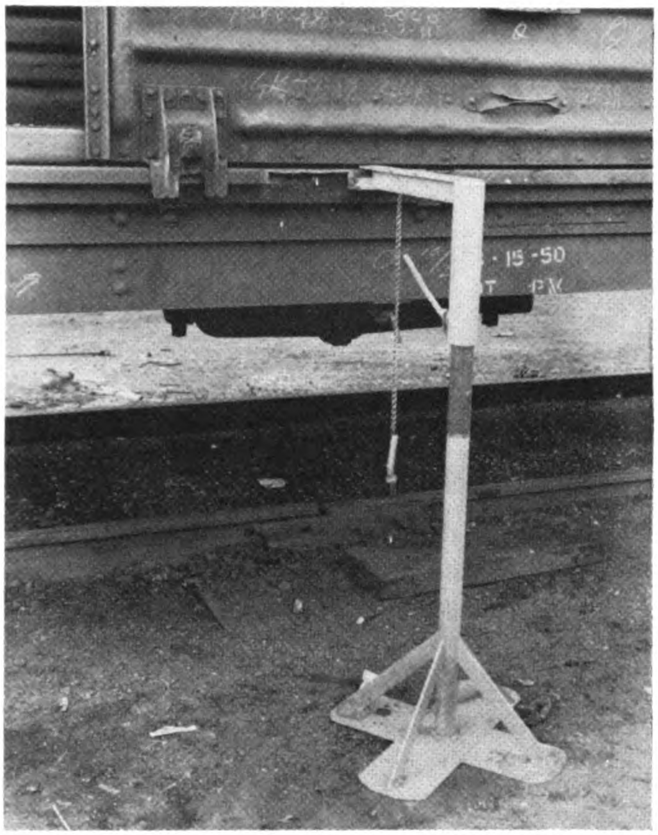


Fig. 2—With a notch larger than the door roller casting burned out of the door track, the groove on the end of the stand can be slipped under the door track and the door pulled out as shown in Fig. 3.

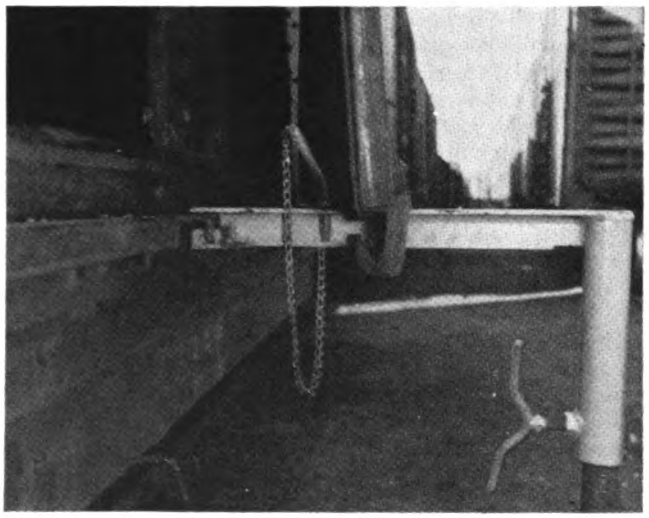
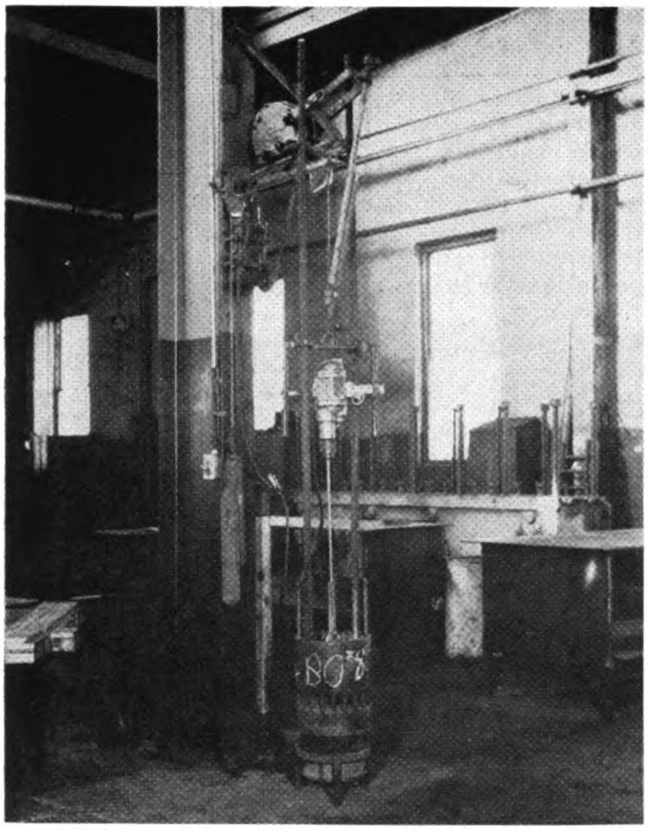
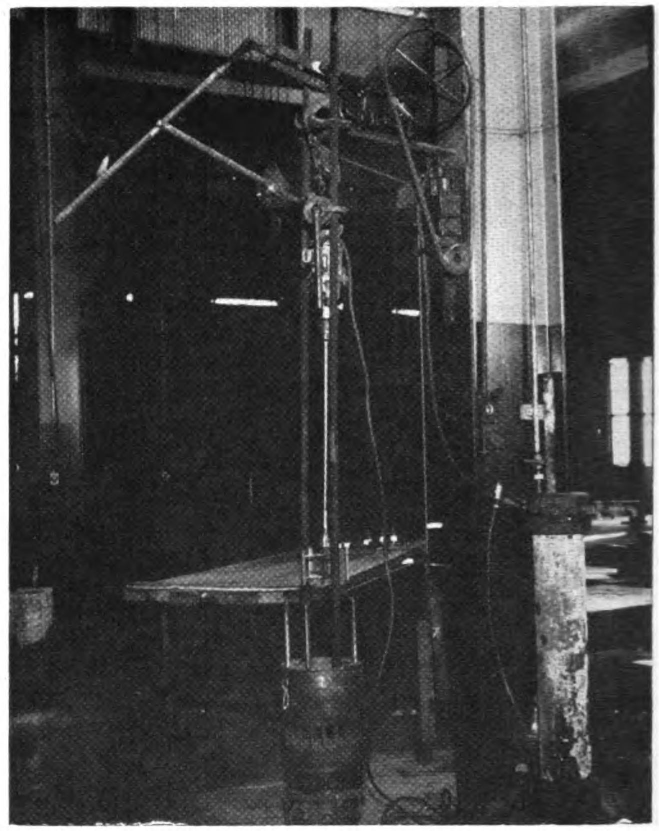


Fig. 3—How the groove in the end of the stand fits under the door track and how the pin holds the door out while the door is supported by the stand.



Honing arrangement driven by air motor through jack pump gives constant feed speed and length of stroke.



The upper lever disconnects easily by a sliding clamp and avoids complete dismantling of the set-up to inspect the tool and job.

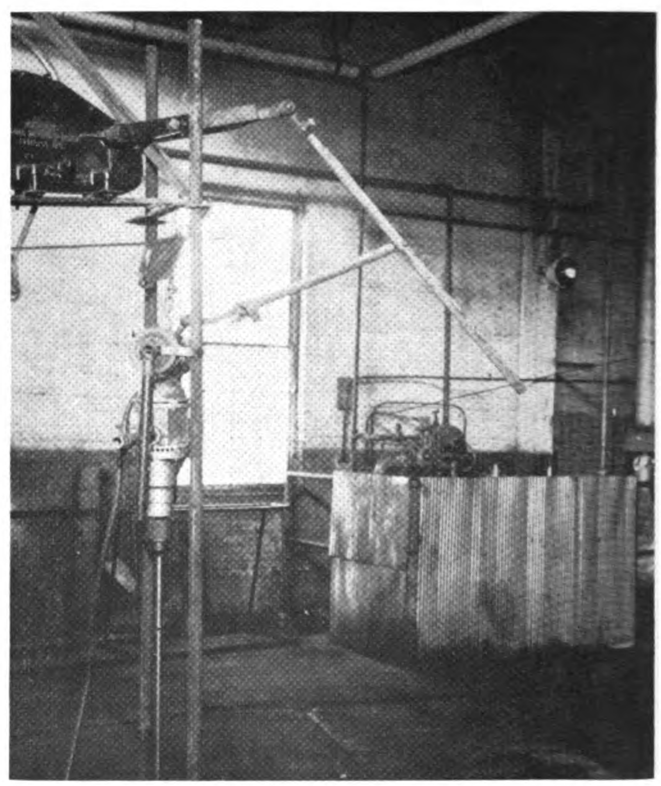
Honing Arrangement

The Peoria & Pekin Union hones Electro-Motive cylinder liners with an arrangement that includes a well jack pump for the reciprocating motion. The inclusion of the jack pump gives the hone a stroke of constant length and consistent feed speed without special attention of operator.

The jack pump is driven by an adjustable-speed air motor through two pulleys. The shaft is counterweighted so that the air motor works against an equal, but light, load on both the up and the down stroke, and therefore travels at the same speed on both strokes. The reciprocating speed is varied to suit individual conditions but averages about three double strokes per minute. All honing is done dry at a constant speed of 425 r.p.m. with the honing tool driven by an electric drill motor. Overtravel of the honing stroke is 1½ in. on each end.

For the honing operation the liner rests on a three-legged stand made of bar stock ⅝ in. by 1 in. The bottom liner seal is left in place to give added friction between the liner and the stand to prevent the liner turning while the hone is revolving.

The honing tool is guided in its vertical motion by two 1-in. pipes. The bottoms of the pipes fit over a pair of opposite liner studs, and the tops slip through two holes in the mounting bracket for the driving arrangement. The carrier for the electric drill motor rides on these two pipe guides on two wheels 1½ in. by 4½ in. The wheels are held against the guides by the reaction from the turning of the hone. A U-shaped section of strap iron 1/32 in. by ¾ in. on one side of one wheel and the opposite side of the other wheel prevents disengagement of the carrier from the guides. The drill is held to its carrier by two ⅜-in. bolts.



The top leverage system in dismantled position.

QUESTIONS AND ANSWERS

Diesel-Electric Locomotives*

Cleaning Cooler Tubes

505-Q.—If this occurs what steps should be taken? A.—A check should be made of the cooler.

506-Q.—What is the first operation for this check? A.—Drain shell side of oil through the pipe tap in the bottom shell flange. Leave this drain open.

507-Q.—What operation should follow? A. — Drain water system, blank off water inlet and outlet connections. Fill cooler full of water.

508-Q.—Should pressure be used to locate leakage? A.—Air or water pressure not to exceed 50 p.s.i., connected at the pipe located in the bottom end cover.

509-Q.—What will be the indication of leakage? A.—If any leakage exists, water will presently appear at the open drain.

510-Q.—In what other way may the tube leakage be detected? A.—By applying pressure similarly at the oil side. Tube leakage can be observed by removing end covers.

511-Q.—In case of leakage what should be done? A.—Cooler must be removed to the shop for dismantling to locate the failure.

512-Q.—What is the water capacity of the tubes? A.—Eleven gallons.

513-Q.—What is the oil capacity of the shell? A.—Sixteen gallons.

514-Q.—What type strainer is used and how does the oil flow? A.—The strainer is of the basket type, with oil entering the bottom and flowing up through a spool containing a series of staggered holes.

515-Q.—From the spool where does the oil travel? A.—From the spool oil dumps into a fine brass mesh screen enclosed by a steel perforated shell.

516-Q.—What attention should be given the strainer element? A.—It should be cleaned at each filter change or more often if necessary. In cleaning the element never use steam or a strong cleaning solution.

517-Q.—How is the diesel engine protected from low lubricating oil pressure? A.—By two switches known as OPS.1 and OPS.2.

518-Q.—How does the OPS.1 switch function? A.—The OPS.1 is set for 20 p.s.i. and returns the engine to idle when the throttle is in the 5th, 6th, 7th, or 8th notch.

519-Q.—How does the OPS.2 function? A. — The OPS.2, set for 7 p.s.i., will shut the engine down in all throttle positions.

520-Q.—How can the engine be operated at partial load in the event that lubricating oil pressure drops below 20 p.s.i. and remains above 7 p.s.i.? A.—By returning the engine control knob on the engine control panel to No. 4 position.

521-Q.—Where are these switches located on freight and passenger locomotive? A.—In the left section of the engine control panel.

522-Q.—Where are they on road switchers? A.—In the engine compartment on the left side of the rear bulkhead.

Diesel-Electric Locomotives
Lubricating Oil System

523-Q.—How can the internal working parts of the switch be exposed?
A.—The switch cover is easily removed by loosening the knurled knob at the front of the case. After the cover is removed the internal working parts of the switch will be exposed.

524-Q.—Is it necessary to remove the cover when making pressure adjustments?
A.—No. Each adjustment is made by means of external adjusting screws equipped with an indicator and calibrated scale clearly visible through a window in the cover.

525-Q.—What pressure adjustments are made?
A.—Two—Range and Differential.

526-Q.—Where are the adjustment screws located?
A.—They are located on top of the case, the left one for range adjustment and the right one for differential adjustment.

527-Q.—How is the range or cut-in pressure adjusted?
A.—Raised by turning the left adjusting screw to the right and lowered by turning to the left.

528-Q.—What is meant by "differential" pressure?
A.—It is the difference between the cut-in and cut-out pressure. On locomotives with only one OPS, the differential should be set at minimum, actually no adjustment.

529-Q.—Why should these switches be checked at least monthly?
A.—To insure against maladjustment resulting from vibration or any other cause. Many railroads seal these adjustments to prevent unnecessary tinkering.

530-Q.—What should be done before changing the setting of these switches?
A.—The high pressure lubricating oil gage and oil lines should be checked first.

Cooling Water System

531-Q.—What is the arrangement insofar as the cooling water system is concerned?
A.—The engine in each locomotive has an individual cooling water system.

532-Q.—At which end does the cooling water enter the diesel engine?
A.—At the free end.

533-Q.—How is the cooling water circulated?
A.—By a centrifugal pump, gear driven from the crank shaft.

534-Q.—From the pump, where does the cooling water flow?
A.—To right and left bank headers to supply water to both banks of cylinders.

* This series of questions and answers relate specifically to the Alco-G.E. Diesel electric locomotives.

535-Q.—Trace the flow further.
A.—Water then flows up through the space formed by the liner and the jacket, enters the cylinder heads and out through the elbows which are connected to the water outlet headers.

536-Q.—How does the cooling water then flow?
A.—Water then flows to the radiators and cab heaters.

537-Q.—How does the cooling water flow from the radiators?
A.—Cooled water from the radiators flows through the oil cooler and finally to the water pump.

538-Q.—Where is the water expansion tank located?
A.—At the highest point in the cooling system.

539-Q.—What is the expansion tank equipped with?
A.—A sight level glass, a filler connection through the roof and an overflow pipe.

540-Q.—What precautions should be taken?
A.—The engine should not be operated without water showing in the sight glass and should not be operated with the sight glass completely filled. Operating with a ¾ glass is recommended.

541-Q.—What water temperature is maintained?
A.—Water temperature of 140 to 160 deg. is maintained by thermostatically controlled shutters and fan as the water passes through the radiators.

Schedule 24 RL Air Brakes

Suggested Procedure When Pipes Are Broken

1360-Q.—Why is it necessary to drain the auxiliary reservoirs and have them open to the atmosphere?

A.—This is done to guard against the possibility of cock key leakage, resulting in a stuck brake.

1361-Q.—How may the reservoirs be drained?

A.—By removing a reservoir pipe plug or disconnecting pipes 2, 3, or 5.

Operation of the B Type Relay Valve

1362-Q.—When a brake application is made what air pressure flows to the relay valve?

A.—Air from control pipe *16*.

1363-Q.—What action results from this flow of air?

A.—Air from the control pipe builds up in chamber *B* on the face of the relay valve piston *17* (Fig. 27) moving the piston and attached piston lever *19* upward,

1364-Q.—Is there any resistance to the upward movement of the piston?

A.—Application valve spring *38* resists the first movement of the piston.

1365-Q.—What results from the resistance to this movement?

A.—The resistance of the spring causes lever *19* to fulcrum at the right end, between application valve stem *34* and adjusting screw *24*.

1366-Q.—With the lever thus fulcrumed at the right end, what happens?

A.—The left end of the piston lever moves upward.

1367-Q.—What action takes place with the upward movement of the left end?

A.—As the left end of the lever moves upward, it lifts exhaust valve stem *26*, seating exhaust valve *27* on its seat on the piston *29* and moving the latter against its bushing seat.

1368-Q.—When the piston moves against its seat, how is the movement of the left end of lever 19 affected.

A.—As the piston seats, it limits the upward travel of the lever at the left end.

1369-Q.—What communication is broken off with the closing movement of the exhaust valve and piston?

A.—Connection between the brake cylinder (chamber A) and the exhaust passage (EX.) is closed off.

1370-Q.—If the upward travel of the left end of the lever is stopped, does lever movement cease?

A.—No. The lever is now fulcrumed at the left end and as piston movement continues upward, the right end of the lever lifts the application valve stem *34*, unseating pilot application valve *37*.

1371-Q.—What is accomplished by the unseating of pilot valve?

A.—Main reservoir pressure above the application piston flows into chamber *A* and the brake cylinder faster than the rate of supply permitted by choke *12*.

1372-Q.—What does reduction of pressure above the application piston bring about?

A.—Main reservoir pressure underneath then lifts the piston, permitting main reservoir flow to the brake cylinders.

1373-Q.—What advantage is gained by the use of pilot valve and choke 12?

A.—By reducing the force required to open the large application piston valve, the pilot valve and choke function to provide easy sensitive operation of the large application valve.

1374-Q.—How long does brake cylinder build up continue?

A.—Until pressure in chamber *A* equals that in chamber *B* on the face of the relay valve piston (control pipe pressure).

1375-Q.—What takes place when the air in both chambers is equal?

A.—Application piston and its pilot valve are returned to their seats by their respective springs and stem *34*, the right end of lever *19* and piston *17* are moved downward.

1376-Q.—What flow of air is then cut off?

A.—Main reservoir to brake cylinder.

1377-Q.—How is the exhaust valve affected during the above movement?

A.—During this movement the left end of the lever pivots between spring *25* and stem *26* and holds the exhaust valve seated.

1378-Q.—What is now the position of the relay valve?

A.—This is *Lap* position in which the relay valve maintains brake cylinder pressure against leakage.

1379-Q.—What takes place in the event that a reduction of brake cylinder pressure occurs?

A.—Any reduction of brake cylinder pressure in chamber *A* on the back of the piston, below that in chamber *B* and the control pipe, will reopen the application valve to restore brake cylinder pressure.

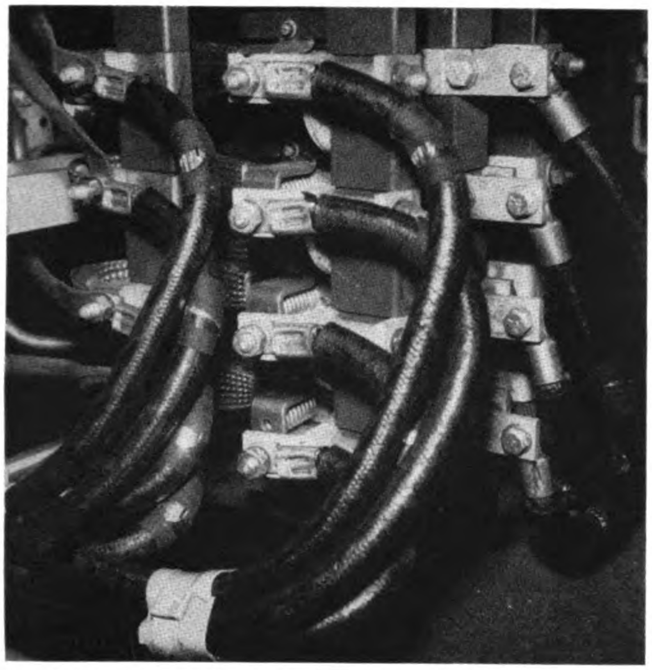


Fig. 1—Indent type terminals applied to power cables on a four-motor reverser

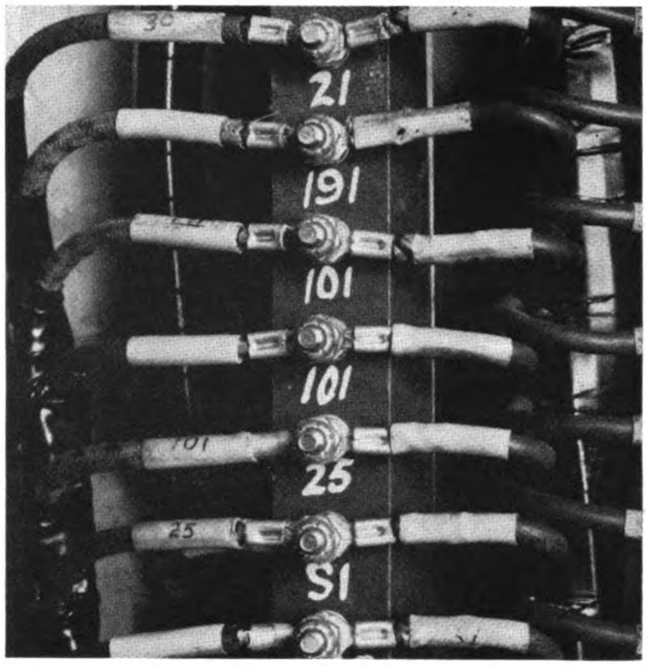


Fig. 2—Indent type terminals applied to control wiring. Marking sleeves pulled back to show terminals

Solderless Terminals for Locomotive Wiring

Why and How pressure-type terminals are applied and what is to be expected of them when used on diesel-electric motive power

*By R. L. Chapman**
*M. D. Henshaw**
*R. J. Nedreski**

THE shortage of tin and its allocation to uses other than for solder was one of the major reasons for the rapid growth in the use of solderless or pressure-type terminals during the past decade. Satisfaction with their performance dictated their continued use after the actual necessity no longer existed. Now the cycle of world events appears to have brought us once more to the place where the original advantage will again become important.

Locomotive Requirements

This article is written from the viewpoint of locomotive wiring practice, presenting problems in the selection and use of terminals which appear to be peculiar to a mobile unit. It necessarily covers specifically only those terminals in use in our shop and with which we are familiar, but is believed to be generally applicable to all pressure-type terminals.

Because of installation and service requirements, locomotive wiring must be flexible. Hence, it is made up of multiple strands of fine wire, usually No. 24 or smaller, as contrasted with the solid conductor or coarse stranding

* All of the Locomotive and Car Equipment Department, General Electric Company, Erie, Pa.

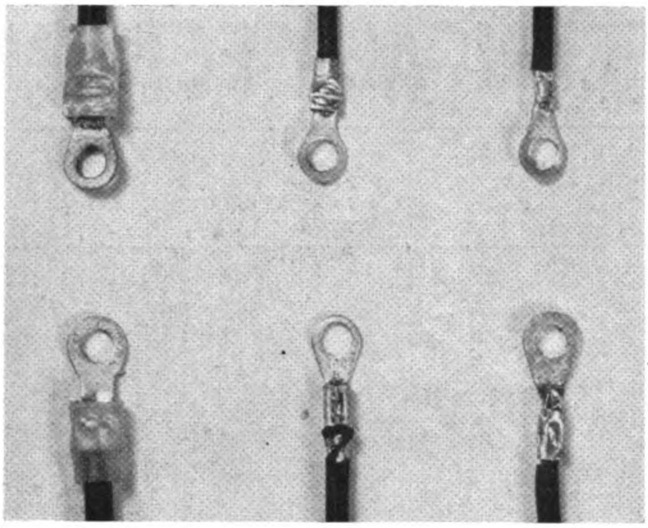


Fig. 3—Two makes of terminals in various types: (left) Pre-Insulated; (center) Insulation grip; (right) Plain

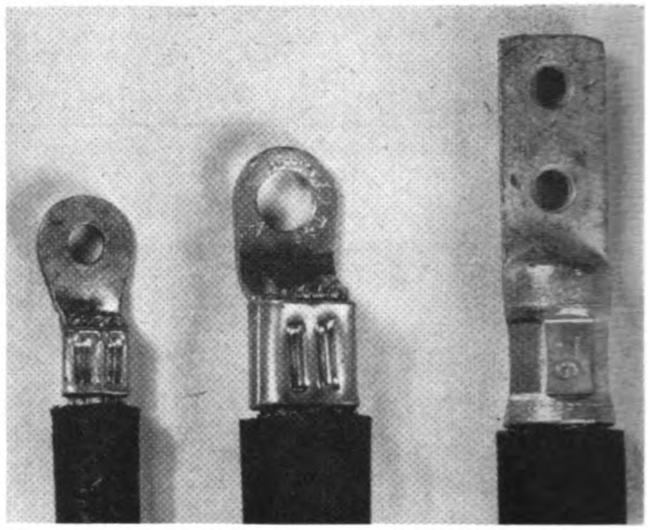


Fig. 4—Pressure terminals applied to power cables: (left) indent type on 91/24 cable; (center) indent type on 650/24 cable; (bottom) compression type on 650/24 cable

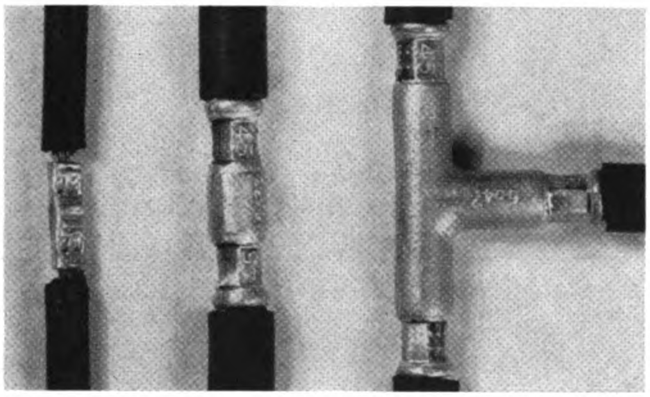


Fig. 5—Two-way and three-way connectors applied to intermediate size cable; (left) indent type two-way; (center) compression type two-way; (right) compression type three-way

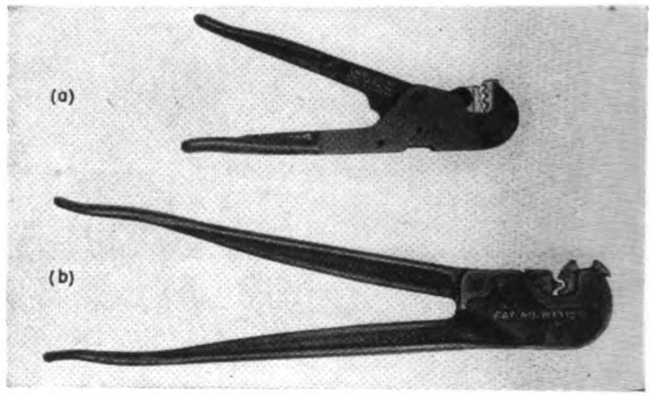


Fig. 6—Hand tools for application of indent type terminals: (a) Tool for No. 16 through No. 10 wire sizes; (b) Tool for No. 8 through No. 4 wire sizes

used industrially. These strands must be compressed to leave a minimum of voids in the barrel of a pressure type terminal. This requires that terminals be carefully sized to match the conductor with which they are to be used. Typical views of applications to locomotive wiring are shown in Figs. 1 and 2.

Another limiting feature is that space is at a premium in a locomotive. This usually requires that terminals on devices be placed as closely together as insulation considerations permit, and hence that these terminals be small and compact.

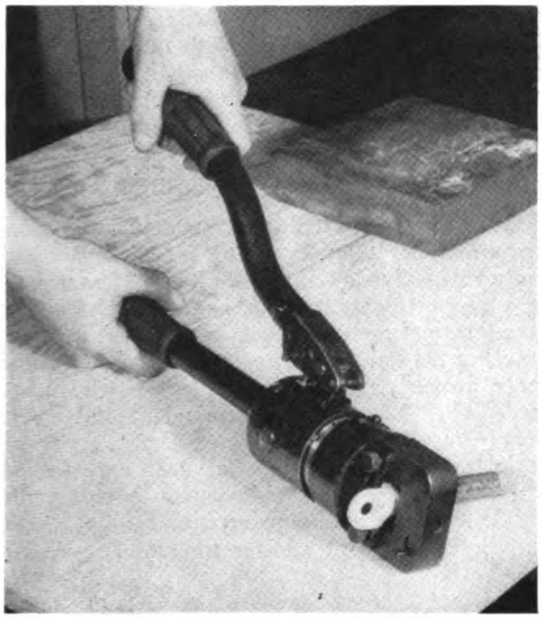
A third consideration in locomotive work is that of vibration. This tends to flex the terminals resulting in fatigue and breakage. It also tends to shake them loose, causing short circuits between terminals as well as increased contact resistance, with consequent excessive voltage drop and heating. Heating in itself, even without vibration, is a factor of major importance in locomotive power circuits since the current required during the time the locomotive is exerting its maximum tractive force will be several times the normal current demand at which the cable and its applied terminal are rated.

A terminal may fail from breakage or from poor contact, either at its bolted surface or between the inner surface of the barrel and the wire. Such a failure may, at the least, cause the locomotive to be held out of service. At the worst, it might cause a bad fire. Therefore, every effort is made to insure that all terminals are mechanically and electrically adequate to resist vibration and rough handling and to insure the continuity of the circuit.

The pressure-type terminal has met these requirements for both control and power circuits on all types of locomotives, with a minimum of trouble of any kind. Both general classifications are used, depending upon their application: (1) indent type for small and medium sizes and (2) compression type for all sizes, but particularly for large sizes for power wiring. The indent type is smaller, lighter, costs less since it is generally fabricated, and lends itself to ready application with light tools, either hand or power. The compression type is generally cast or forged, requires heavier tools with more power for its application, costs more, and is more expensive to apply.

Terminals Fall Into Three Classes

These terminals may be divided into three classifications with respect to the design of the cable end, as shown in Fig. 3: (1) plain; (2) with insulation grip; (3) preinsulated. As the name indicates, plain terminals are uninsulated and have no provision for gripping the insulation. They are available in both indent and compression



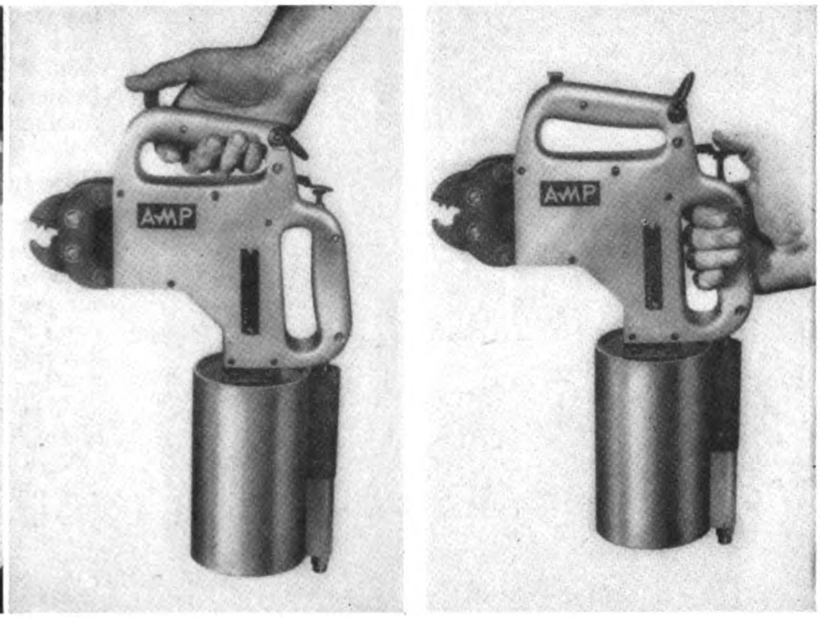


Fig. 7—(left) Hand hydraulic tool. Fig. 8—(center and right) Pneumatic hand tool with double contact

types and in all sizes and are used where the diameter over the insulation greatly exceeds the bare wire diameter or where vibration is not severe enough to require an insulation grip. Insulation grip terminals are generally, but not necessarily, confined to the smaller sizes where vibration or the possibility of other strains dictates this extra precaution. They are also available in both indent and compression types. Preinsulated terminals are available only in the smaller sizes and have their greatest value where space is at a premium and terminals must be placed close together. Plain terminals with an insulating marking sleeve (Fig. 2) also serve admirably in the same type of applications, but do not lend themselves to color coding as readily as do the preinsulated terminals, which may be obtained in a limited range of colors.

Typical indent and compression type plain terminals applied to power leads are shown in Fig. 4.

Many forms of terminals besides the usual ring tongue are available. These include spade, flag, hook, four-way, etc., but they are used as little as possible in order to minimize inventory and storage problems. In addition to terminals, connectors, as shown in Fig. 5, are available in both indent and compression types. The special center-tongue motor lead connector, illustrated at the bottom of Fig. 4 is used where interchangeability with a former solder type connector must be maintained.

Insofar as possible, wiring is completed in locomotive sub-assemblies and in bench layouts, leaving only a minimum number of terminals to be applied at final assembly in the locomotive. All control panels are completely wired with prefabricated harnesses. A similar procedure is followed for lockers and compartments, when the quantity justifies a bench layout. Power leads are made up as a group with terminals on one end only. The other terminal is applied at final assembly after the actual length of each lead has been accurately determined.

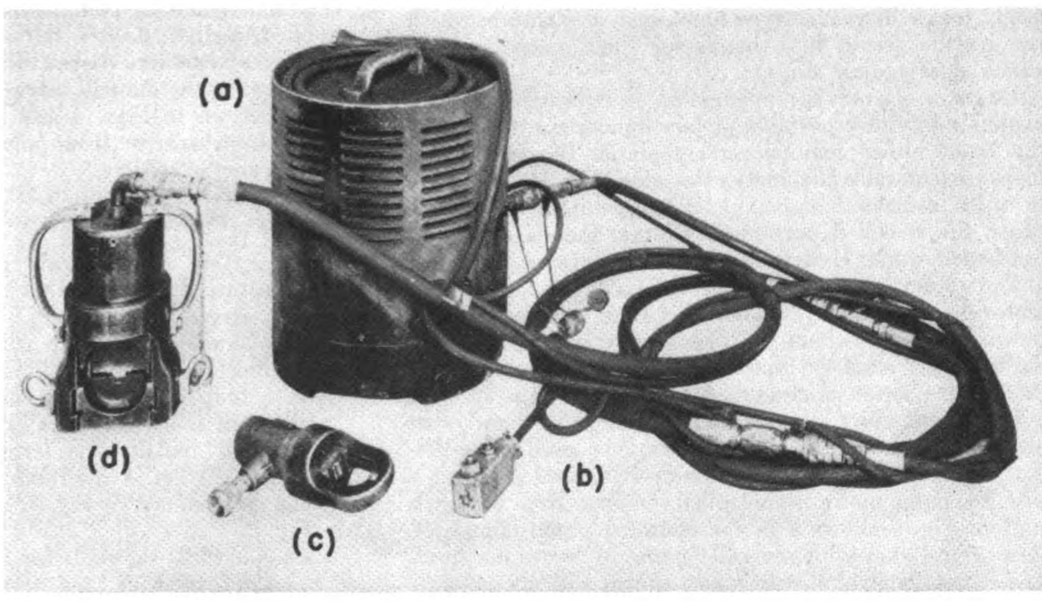


Fig. 9—Power tools for application of compression type terminals. (a) Motor-operated hydraulic pump; (b) Remote control switch; (c) Seven-ton ram; (d) 40-ton ram

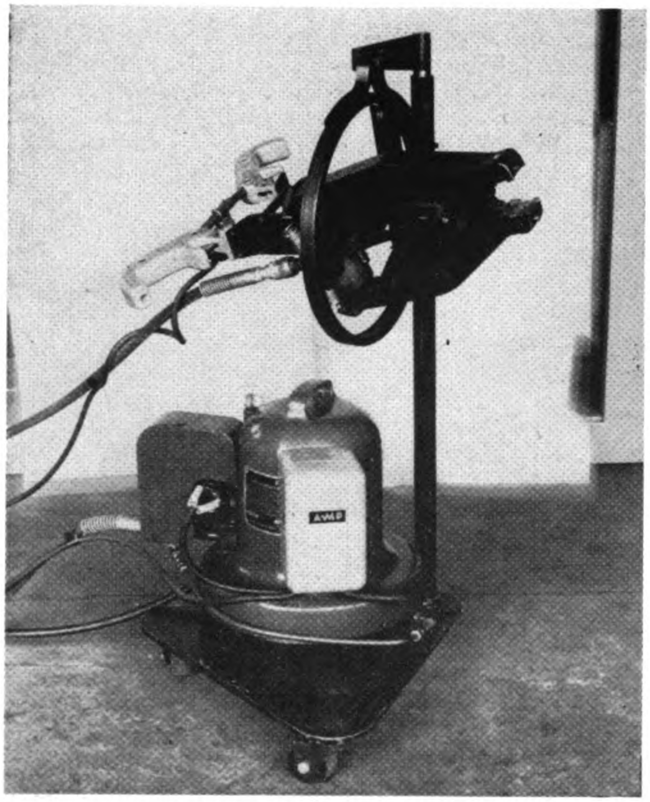


Fig. 10—Electro-hydraulic tool

Tools Required

Tools for applying the terminals may be hand-operated for the smaller sizes or power operated for all sizes of terminals. The type of installation procedure largely dictates the type of tool used. Hand operated tools are of three general types: (1) plier; (2) toggle; and (3) ratchet; to furnish the increasing power required from the small to the larger size terminals. The trend in the toggle type tool for small terminals is toward an irreversible or self-locking tool, such as shown in Fig. 6-a. Once the operation is started with this tool, the motion must be completed before pressure on the terminal can be released. This eliminates the hazard of failing to close the handles completely. Such a failure is not noticed in the larger toggle or ratchet type tools, such as Fig. 6-b, which require the use of both hands for their operation, and which close against stops.

Power tools may be pneumatic or hydraulic and are available in either portable or bench-mounted types, with the latter either manual or automatic. Bench-mounted tools are generally pneumatic. Portable tools are hydraulic in order to make them completely self-contained. In some cases, the so-called portable hydraulic tool is also used for bench work. Hydraulic tools are operated either by a foot pump, as in the smaller sizes, or by an electric motor-driven pump. The latter is mandatory for large power terminals where the pressure required is beyond the range of hand or foot-operated tools. In either case, the pump portion is connected to the ram or head with one or more short sections of hydraulic hose fitted with disconnect couplings so the ram may be used some distance away from the hyraulic pump if desired. In such a case, the pump motor is controlled remotely from the work station. Fig. 9 shows a motor operated pump connected to a 40-ton ram with several lengths of hydraulic hose. The remote control switch is also shown with its connecting leads. The 7-ton ram, shown disconnected from the hose, can be used interchangeably with the 40-ton ram. from this motor-operated pump. The small ram can also be similarly connected to a foot-operated pump if desired. Another type of electro-hydraulic tool is shown in Fig. 10.

How to Spot a Badly Applied Terminal

Regardless of the type of tool used, the application does not involve a hammer blow as with a punch. Instead, it is based on a relatively slow rate of build-up of ram pressure with a proportionately slow change in shape and stress of the terminal material. It is important, therefore, that the travel of the ram be fully completed on a terminal that has been properly selected for the size of wire being used in order to insure that the terminal application is acceptable.

Very little trouble of any kind has been experienced with pressure terminals. The few instances that occurred were traceable to one of the following causes:

(1) Wire pulled too tight, causing tongue of small-size terminals to break off.

(2) Tongue not properly annealed or of faulty material, leading to same result.

(3) Travel of ram incomplete, resulting in the terminal being loose on wire.

(4) Wrong terminal size used.

(5) Use of untinned copper wire.

Cause (1) has been overcome by inspection and education. Cause (2) was corrected by the manufacturer, and has since also been materially changed for the better by a change in shape of the tongue. Cause (3) occurred mostly with plier-type tools which have been almost completely replaced by the self-locking toggle-type. The only cases of trouble due to wrong terminal size, cause (4), also involved cause (5) and, needless to say, is not recurring. Bare copper wire is no longer used, and sample specimens are made up whenever new wire sizes are involved, thus insuring that the proper size terminal is used.

The application of pressure terminals is quite suited to quality control since visual inspection is all that is necessary to assure that a proper application has been made. For terminals of the indent type, even a slight reduction in pressure shows up as a shallow indent. Improper placement of a terminal in the ram causes improper placement of the indent. The use of too large a terminal results in the barrel being squeezed out of shape with the indent not centered. When the compression-type terminal is properly applied, a slight flash is left where the two halves of the die come together. Also a die number or other symbol engraved in the die will leave a sharp pattern on the barrel as shown in Figs. 4 and 5. Defective tools, whether faulty from wear or from poor alignment, leave the same telltale characteristics.

Service Replacements

While this article deals primarily with locomotive manufacture, it is important to consider the question of field or service replacements. Here the problems are not those of an assembly line with its quantity production, but rather those of occasional installation without production tools. Several alternatives are available.

First, the tools shown in Fig. 6 are not expensive and will handle indent type terminals for all control and auxiliary wiring. A hydraulic hand tool for larger size terminals is shown in Fig. 7, and a pneumatic hand tool in Fig. 8.

Second, while the tools for compression type terminals are more expensive, the terminals themselves can be

soldered on to the cables just as well as any solder type terminal to which the user may have been accustomed.

Moreover, any damaged terminal of either type may be removed completely and replaced by a conventional solder-type terminal if no tools are available to apply another of the pressure type. This can be done without cutting off or shortening the cable by using a hacksaw to cut an X in the barrel of the terminal to be removed and spreading the points of the X to loosen the terminal on the wire.

Our experience indicates that pressure-type terminals have met all the requirements for good terminals in locomotive service. They have minimum size, adequate mechanical bond and fatigue strength, satisfactory electrical characteristics, continuing tightness and long life. The installed cost is low; and assembly, inspection and field replacement, are easy. It is to be expected that they will continue to be used in increasing numbers in all phases of locomotive wiring, both during initial manufacture and in service replacements.

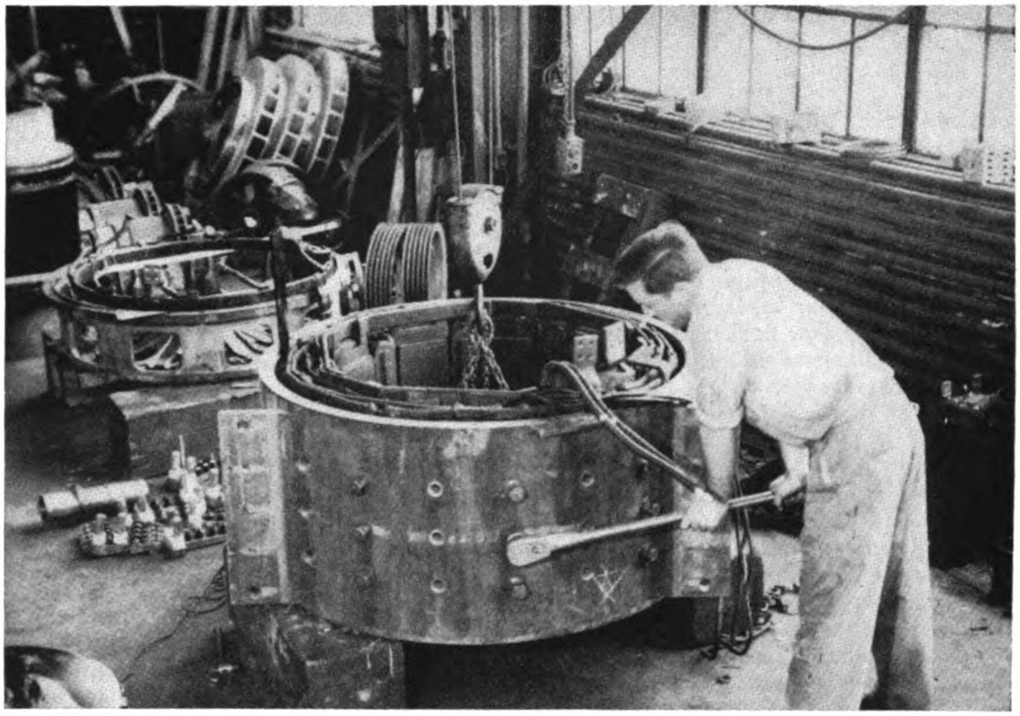


Fig. 1—With the field coils and pole pieces suspended from a hoist it is a simple matter to remove or replace the cap screws which secure the main poles and interpoles to the frame

Generator Field Overhaul

The Boston & Maine removes coil and pole assembly as a unit and uses "high hat" for applying insulating varnish

INSPECTION, cleaning, repair of field leads, replacement of coils and reinsulating of diesel locomotive generator fields has been effectively improved and simplified in the North Billerica, Mass., shops of the Boston & Maine, by the use of two simple devices.

One of these is a circular plate of $\frac{1}{2}$-in. steel plate having a diameter $\frac{1}{2}$ in. less than the bore of the field frame. The plate is fitted with three eye bolts for lifting. They are 120 deg. apart in a circle which is slightly smaller than the diameter of the armature.

When a generator field is to be overhauled, all parts attached to the ends of the field frame or yoke are removed and the frame is placed on its side over the circular plate.

Three lifting chains from a hoist are then hooked to the three eye bolts in the plate as shown in Fig. 1. The cap screws which hold the pole pieces are then removed and the entire field coil and pole assembly with all leads intact is removed from the frame as shown in Fig. 2. In this position, it is possible to make a thorough inspection, and it is much easier to replace a faulty coil or lead or replace damaged lead insulation than it is when the assembly is inside the frame.

After all necessary repairs have been made, the assembly is moved on the plate to the spray booth where it is thoroughly cleaned. After cleaning, with the assembly still on its side, it is lowered into the field frame and the pole piece cap screws replaced and tightened.

High Hat Reinsulation

Insulating varnish is applied to the field assembly with the aid of what the shop men have dubbed, "The High

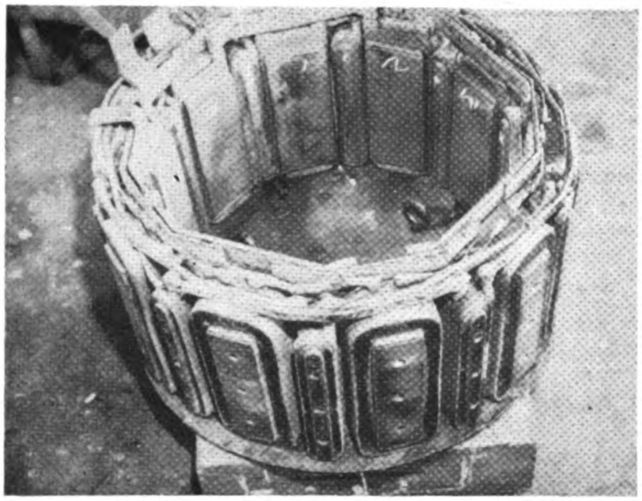


Fig. 2—Complete field coil and pole piece assembly of an EMD-D8 generator after removal from the frame. Two of the three eye bolts on the lifting plate may be seen

Hat." This is shown upside down in Fig. 3. The brim or lower flange is four in. larger in diameter than the outside of the generator field frame. The crown or cylinder is the same diameter as the generator armature. There is a neoprene gasket on the brim which is the same diameter as the field frame and there is a ring of bolt holes close to the edge of the brim.

For applying varnish, the field is heated in an oven for three hours at 250 deg. F. The hat is then placed right side up and the field frame with coils in place is lowered down over the crown until it rests on the gasket on the brim. A number of hook bolts are then hooked over the upper edge of the field frame and through the holes in the edge of the brim. Tightening the nuts on these bolts pulls the brim gasket tight against the lower edge of the field frame.

The spaces around the coils and leads, between the hat crown and the field frame are then filled with insulating varnish. Black air-drying varnish was originally used for field coils but this has been replaced with Westinghouse No. 161 Thermoset varnish used with S 110 thinner.

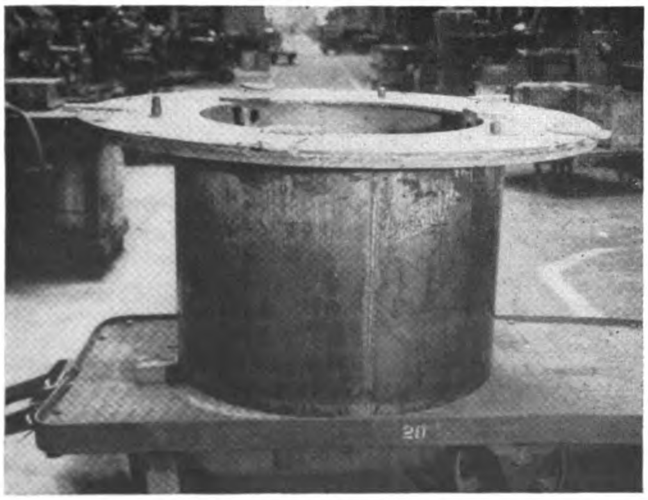
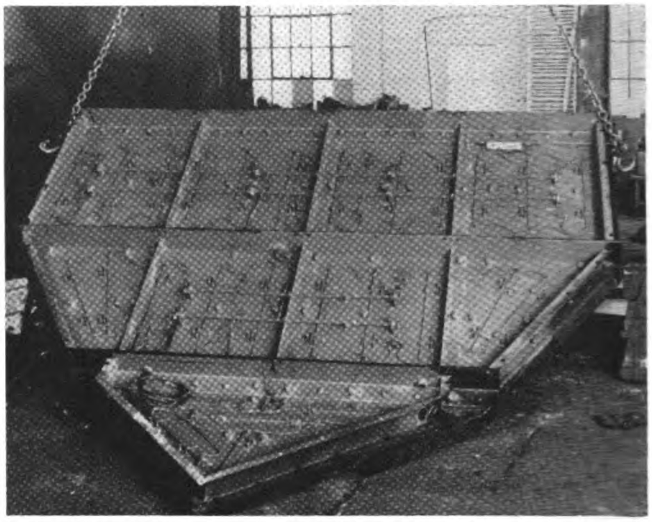


Fig. 3—The "high hat" (upside down) which is used to seal the frame and take the place of the armature when the frame is filled with insulating varnish

When the varnish fills the frame, it is allowed to remain until all bubbling stops. It is then drained out through a valve in the lower edge of the hat crown and the frame is again baked in the oven at 250 deg. F. for three hours.

The procedure should do much to prevent insulation breakdown and also to keep coils and pole pieces tight.



Under side of a bottom-dump ore car showing how strip heaters are applied

Strip Heaters for Ore Cars

The Atlas Car and Manufacturing Company now installs a lacework of strip heaters under the floor of its 60-ton, bottom dump ore-transfer cars as a means of keeping ore from freezing and sticking to the interior of the cars during winter months.

The cars, manufactured by the Cleveland, Ohio, firm, are used for filling the bins on blast furnace high lines. Because these bin-filling cars are generally loaded by buckets, the operation takes enough time to allow the ore to freeze in the inside of the cars during winter months. This makes dumping difficult.

Before the Atlas Company started equipping its cars with General Electric strip heaters, it was common practice to prevent freezing by putting a quantity of burning coke in the bottom of the hopper before loading it.

The heaters are clamped directly to the hopper plates in a manner which allows for expansion and contraction, and also makes individual units easy to replace. Each group of heaters is connected to a fused safety switch at the control panel to facilitate maintenance. To transfer a maximum amount of heat by conduction to the hopper plates, the heaters are clamped directly to the plates.

The heaters, moreover, are enclosed in a steel cabinet with a thermal insulation fastened to the inside of the cabinet's surface. This prevents undue heat loss from the other side of the heaters so that the loss of heat by convection to the surrounding air is also used to warm the hoppers.

To avoid unnecessary use of the heaters and to conserve power, a G.E. heavy duty industrial thermostat is adjusted to cut off power to the heaters when they are not needed. The heaters can be disconnected manually by means of a switch in the coil of the heater contactors.

11 Diesel-Electric Locomotive Excitation Systems

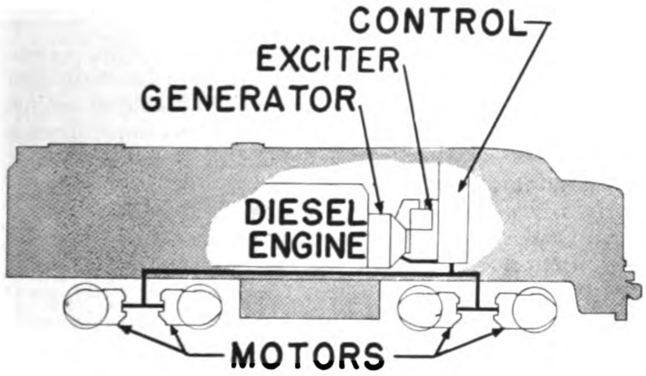


Fig. 1—Relation between main pieces of equipment on a typical diesel-electric locomotive

Up to this point, we have talked about running maintenance of motors and generators. Now we are going to switch over to the locomotive control. This is what makes the diesel engine, generator and motors work together as a smooth-running team. So, it is important to understand how control equipment works and how to care for it.

Back in the first article of this series, we described the main pieces of control apparatus, and explained the circuits generally used on diesel-electric locomotives. Now we want to talk about maintaining this control equipment. Before going into details, however, there is another important part of the general control scheme to look at. This is called the excitation system.

Fig. 1 shows how the diesel engine, main generator, exciter, control and traction motors are related. The excitation system has the job of seeing that these machines work together in the best possible manner. So you can easily see that it is a vital part of the locomotive.

What We Excite and Why

The well known proverb, "A chain is no stronger than its weakest link," is true of locomotives. For diesel-electrics it goes like this: "A locomotive is no better than its excitation system."

We have already seen, in the first article, that the voltage output of a generator depends on the speed of the armature and the amount of field excitation. The current output, on the other hand, depends on the circuit connected to the generator (usually called the "load"). In a diesel-electric locomotive, this load is the traction motors with their cables and switches. These motors should have the right voltage at all times. To get the right voltage, the current in the generator field must be varied to suit the locomotive operating conditions. This is known as excitation control.

This is the eleventh of a series of articles on the maintenance of diesel-electric equipment. This article is written by Harry R. Hill, Locomotive and Car Equipment Department, General Electric Company, Erie, Pa.

The Locomotive's Job

To do its job on the railroad, a diesel-electric locomotive must be able to start a heavy train, bring it up to

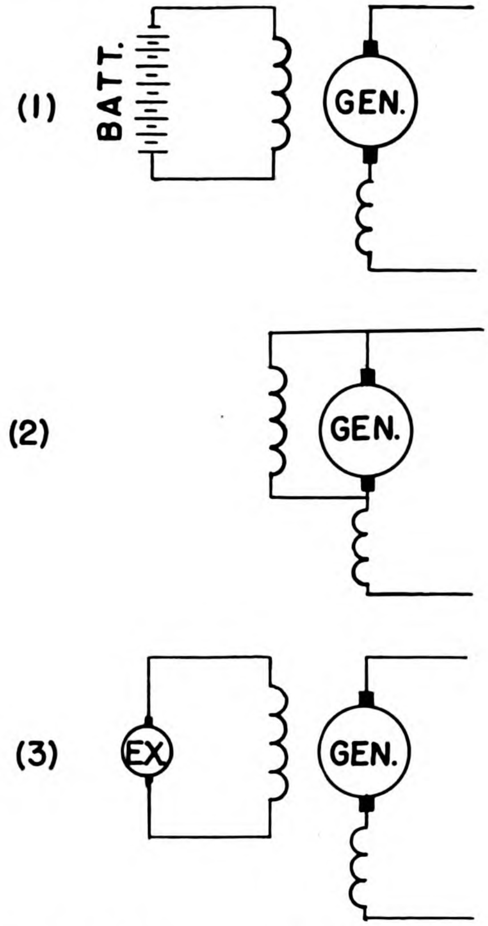


Fig. 2—Three sources of current for exciting the main generator field; (1) battery, (2) main generator armature, (3) exciter

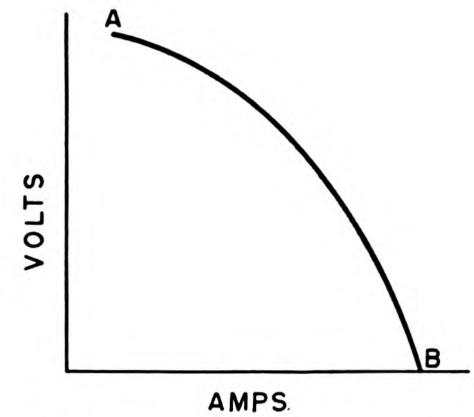


Fig. 3—How the demand of the traction motors varies over the locomotive speed range

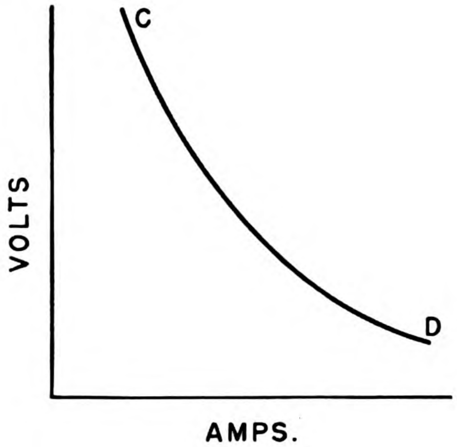


Fig. 4—The constant power output of the diesel engine shown as a volt-ampere curve

running speed, slow it down, and stop it. Just now, we are going to think about only the first two of these duties.

Starting and gaining speed require a large amount of torque, or "twist" on the wheels. You know this if you have ever tried to push your car. It took a large amount of "push" to overcome the friction of the bearings and start the car. Once it began to roll the "push" needed became less. In much the same way, the traction motors must develop a large amount of torque to start a train. Then as it speeds up, less and less torque is required.

The Job of the Excitation System

Now, how can we make the traction motors act like a man pushing a car? Think of three simple things, and you will have the answer: (1) The motor must have current flowing through it in order to develop torque. The more current the more torque. (2) Motor speed depends upon both voltage and current in the motor. (3) Power output equals torque times speed. Translated into electrical terms this is amperes times volts.

Now see how these apply to the job of starting and speeding up a train. We want to: (1) Get high starting torque. To do this, we must send a large current through the traction motors. (2) Increase the locomotive speed. To do this, we must raise the voltage of the main generator. (3) Balance power demand with engine output. To do this, we must reduce the current as the voltage is raised. (4) Reach top speed. To do this, we must raise the generator voltage to the limit.

Here is where the excitation system does its work. It controls the generator voltage, so as to do all four of these things. For this job, it must respond automatically to any movement of the throttle handle, to any change in the load on the generator, or to any combination of both.

Where Excitation Comes From

Excitation systems are of two types: internal and external. In an internal system, the main generator or exciter is built to operate as outlined above. In an external system, control apparatus outside the main generator or exciter is used to get these results. The whole problem is to properly vary the current in the field of the main generator. This current may come from (1) a storage battery; (2) the generator's own armature; (3) a small d.c. generator; or (4) a combination of the above. (See Fig. 2.)

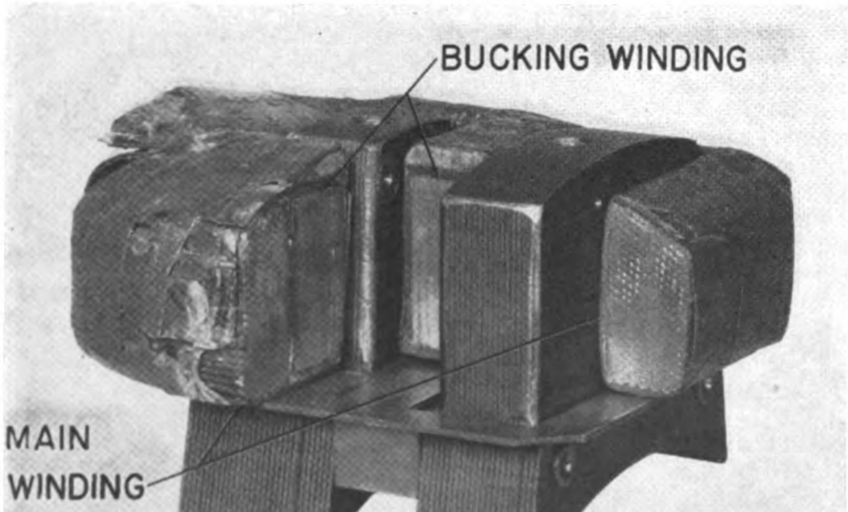


Fig. 6—The two field windings on the pole piece of a split-pole exciter

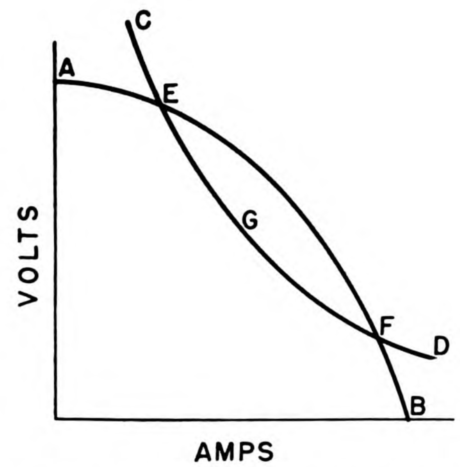


Fig. 5—Motor demand and engine output do not match except at two points in the locomotive speed range

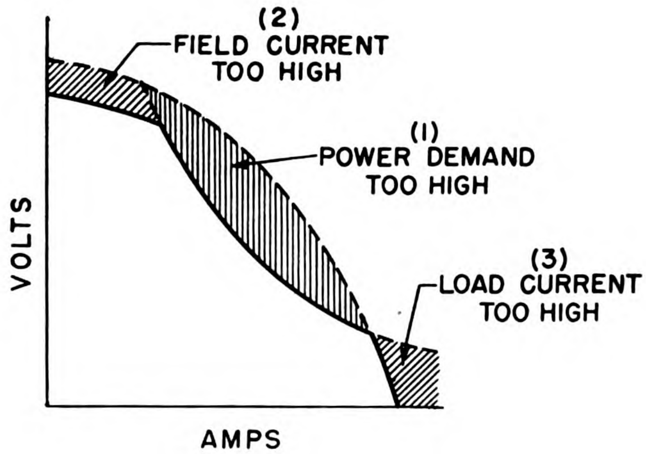


Fig. 8—Three ways in which the excitation system must control the main generator output

A good excitation system matches the diesel engine output and main generator load as closely as practical. If you think a minute, you will see why this must be done. The locomotive motors need high current when starting a train, and high voltage when running at top speed. If we draw a line showing how the current and voltage vary, it will look like Fig. 3. The power output at any point on this curve is volts times amperes at that point. This varies at different points all along the curve. On the other hand, the diesel engine has a constant power output for each throttle setting. If we draw this output curve as volts and amperes, it will look like Fig. 4. When these two curves are put together, as in Fig. 5, they do not match. It is the job of the excitation system to control the generator voltage so as to match them. This means that at all values between *E* and *F* on Fig. 5, the current flow must be just enough to give a constant engine load. This can be done in several ways.

Internal Excitation

A good example of the internal system is found in the split-pole exciter, this machine has a second winding added to its field poles as shown in Fig. 6. The current of the main generator flows through this winding. Therefore, its excitation will depend upon the main generator current output. This field bucks the action of the main field of the exciter. Hence, it will regulate the excitation of the main generator field according to the load on the generator. As a result, the voltage and current output of the main generator will follow the constant power curve (*E*, *G*, *F* on Fig. 5) rather closely.

Differential fields are sometimes used on the main generator. They are windings which buck the main fields to cut down the rise of voltage. This helps to keep the generator output more nearly constant. While this is an example of an internal excitation system, some external control equipment is always used with it.

Combined Excitation

The self-separate system is part internal and part external. It makes use of engine stalling to get the right output from the generator. At low engine speeds, a storage battery separately excites the generator field. This gives fast, positive, smooth voltages response from the main generator at starting. The same field is also connected to the generator armature. As the generator speeds up the excitation furnished by the battery is cut down. At the same time, the generator voltage is rising and its armature is furnishing more of the excitation. Finally, the battery is cut out, and the generator runs as a self-excited machine.

This method does not hold the engine load exactly constant at all times. When a point is reached where the engine is overloaded, its speed drops. This cuts down the generator voltage and also its power output. The speed continues to drop until the diesel engine output equals the generator demand. This is called the engine stalling method of balancing engine power with generator demand. It is used on some switching locomotives, but is not suited to large switchers or road locomotives.

External Excitation

Heavy switching and road locomotives must have top efficiency in using the diesel engine output. To get this,

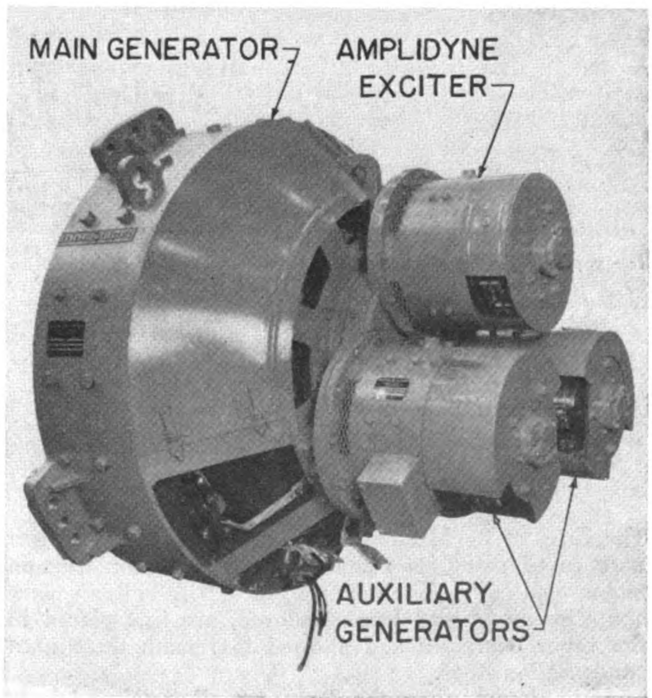


Fig. 7—Typical main generator for road-switcher and road locomotives, fitted with amplidyne exciter

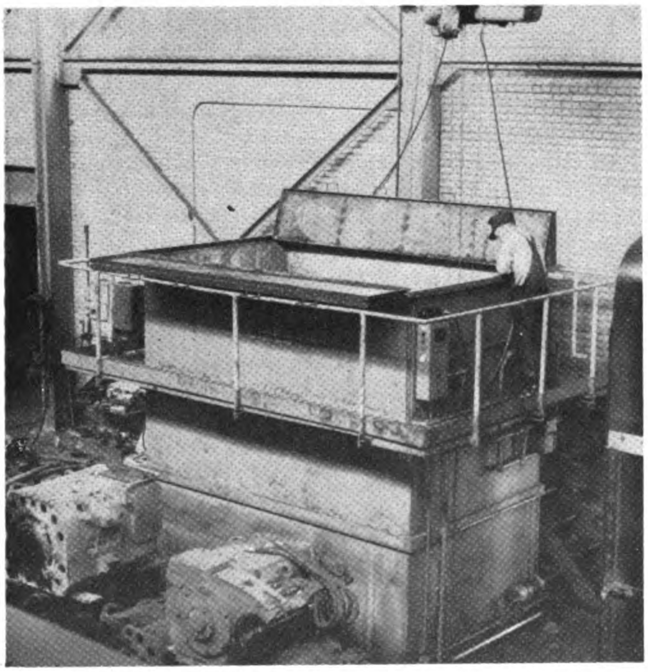
a number of external excitation systems have been designed. For best results, such a system should be controlled by small, accurate pieces of apparatus which respond quickly to any signals. This is possible only if the maximum current and required current changes in the control circuit are both small. For this reason, one such scheme uses the amplidyne generator as an exciter (see Fig. 7). This machine needs only a small current to excite its field. Also, a small change in this field current will produce a large change of voltage power output.

The amplidyne field current may be controlled by a variable resistance operated by the diesel engine governor. Another way is to use a magnetic device called a "saturable core reactor," connected in the main generator output circuit. This works like a magnetic amplifier and controls the amplidyne field current. One advantage of the reactor is that it has no moving parts. Both of these schemes match up the engine power with the generator load. They do this either by changing the speed of the diesel engine or the output of the main generator.

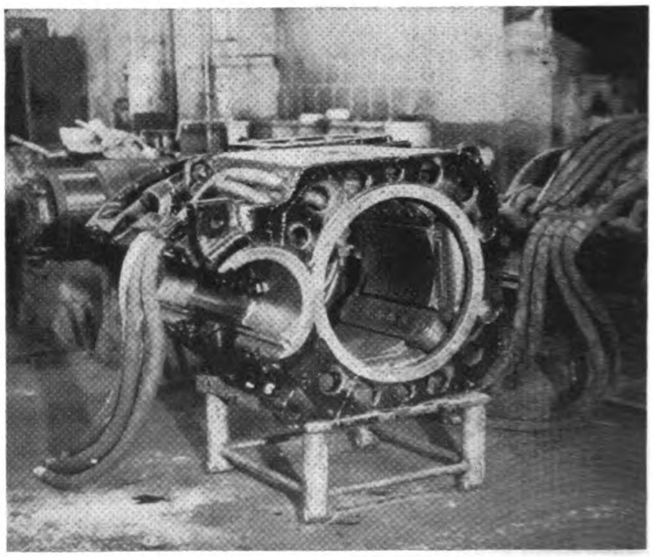
Three Jobs in One

In all except small switching locomotives, it is necessary to control the output of the main generator in three ways, as shown in Fig. 8: (1) To get full use of all available power output of the diesel engine over the widest possible range of generator volts and amperes. (2) To prevent excessive main generator voltage. (3) To prevent excessive main generator current.

We can kill all three birds with one stone by controlling the main generator excitation. This is done by varying the field current of the main generator. In theory, the engineer could do this with a hand-operated rheostat. Of course, such a scheme would not be practical in locomotive operation. The adjustment must be automatic. To get this, we use one of the excitation systems described in this article. These form a most important part of locomotive control. You must have clear understanding of their purpose and how they operate in order to properly maintain the control circuits and equipment.



The vapor degreaser stands on the shop floor and is served by an electrically-operated jib hoist



Completed field frame after impregnation and baking with masking compound removed insulation surfaces sprayed with Glyptol and motor-lead hose replaced

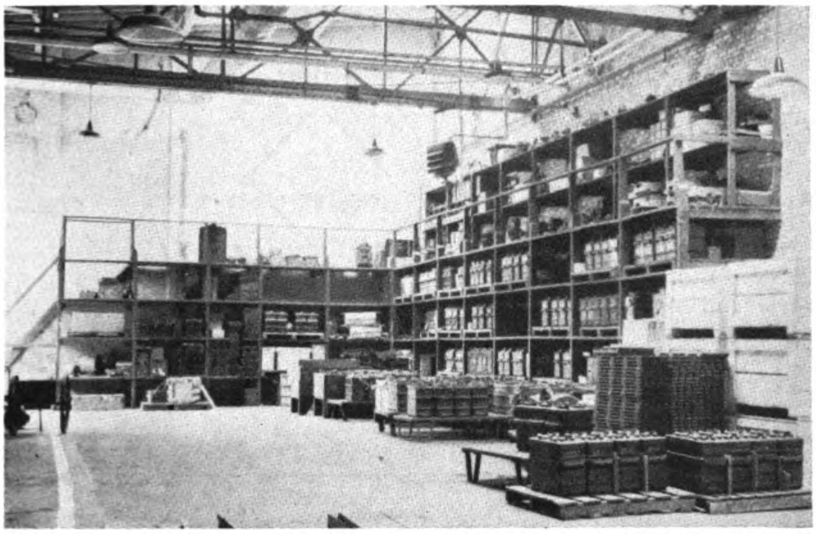
Erie Uses Impregnator For Traction Motor Fields

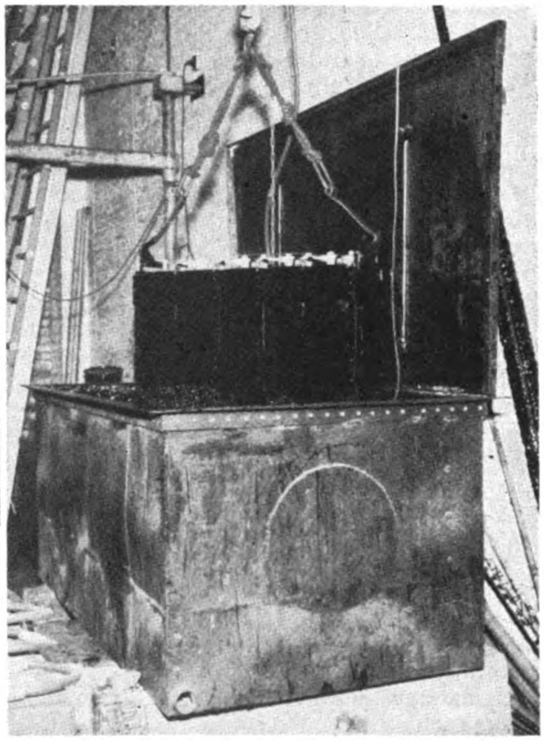
The Erie, at its Marion, Ohio, shop, is now making a practice of using its vacuum impregnator for traction motor field coils. The motor frames, with coils in place and with motor-lead hoses removed, are first placed in the vapor degreaser and allowed to remain there until condensation stops.

After removal from the degreaser, all metal and insulation surfaces are cleaned in a corn cob blast cleaner. Then all machine-finished surfaces, such as suspension-bearing and armature-bearing housing fits, are masked with masking compound. This is painted on with a brush. It dries to a rubber-like consistency, and when it has fulfilled its usefulness, it may be peeled from the surfaces to which it was applied.

With the masking compound in place, the frame is heated in an oven at 240 deg. F. for 10 hours. It is then placed in the impregnator under a vacuum of 28 in. for 20 minutes, after which the varnish is gradually admitted to the impregnator until it reaches the desired level. A pressure of 20 lb. is then applied for one hour.

The frame is then removed from the impregnator and the masking compound removed. After this, the frame is replaced in the oven and baked at 300 deg. F. for 20 hours. The final operation consists of removing the frame from the oven, and spray painting the insulation surfaces with Glyptol varnish. Results obtained by this procedure have been highly satisfactory.





Above: General view of the storage end of the battery room taken just behind the crossways passageway and showing the wide lengthwise aisle which leads to a doorway in the left hand corner of the room. Storage space for batteries and large equipment is along the right wall. Small parts are stored along the rear wall, which space is served by a stairway and ramp

Right: Individual steel-alkaline battery trays are dipped and suspended for dripping by this small hook arrangement. While the tray shown above is dripping excess paint, a second tray is setting in the tank

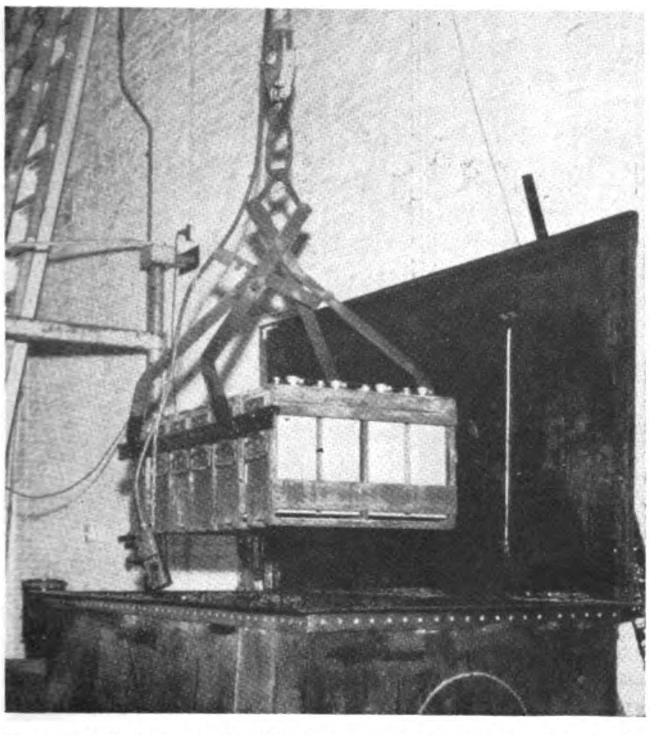
Handling Batteries in the Shop

The Illinois Central handles all the batteries from passenger cars being overhauled at the Burnside Shops, Chicago. The work is done in a separate room 45 ft. by 100 ft,, which can be considered to be divided, though not partitioned, into two sections, a storage end and a working end. The boundary between the two is an 8-ft. passageway across the short dimension of the room extending between doorways in the two side walls.

The battery reconditioning section extends for the first 40 ft. to this passageway, with the remaining 60 ft. devoted to storage on the floor and along one of the side walls and the end wall. The area adjacent to the other side wall is for power generating equipment in the battery shop. A second 8-ft. passageway enters this side wall near the end wall and extends to the lengthwise center of the storage section, thence down the lengthwise center until it meets the first passageway. These passageways are a valuable help in material handling; they permit fork lift trucks to maneuver anywhere in the storage section and on the storage-section edge of the reconditioning section. Ground movement of batteries within the reconditioning area is generally done with a hand-operated lift truck. Batteries to be moved by the fork trucks and those in storage are on skids; those to be moved by the hand lift truck within the reconditioning area are on flats.

Batteries are moved between skids and flats, and for paraffin or paint dipping, by jib cranes, of which there are two. The principal crane has a 15-ft. radius, an electric hoist, and can swing in a full 360-deg. arc. The 360-deg. swing is made possible by the method of distributing the power to the motor. Current is fed to trolley-type contactors from circular bus bars mounted above the jib support. The small jib crane has a radiu sof 8 ft. and is used for dipping lead-acid batteries in the paraffin tank.

Steel-alkaline batteries are handled either as single trays or in groups of six trays for dipping in the paint



Groups of six trays can be dipped at one time using the above holder

tank. Single trays are held by a special lifter for this operation, while groups of six are held either by a second lifter or in the cradle. In either case, one tray or group of trays is dipped while a second is held suspended over the tank for the excess paint to drip off, both operations requiring an average of five to ten minutes.

When the cradle ball bearings are removed, the batteries and the cradle are usually dipped together with the batteries in place in the cradle. When the batteries require painting only, the bearings are normally removed from the cradle and the batteries and the cradle dipped together. When the batteries need a general overhaul, they are usually removed and dipped separately from the cradle after repairs. At the same time, the cradle is usually stripped to remove dust and dirt, given a general overhaul, and then dipped separately.

Armature Nut Wrench

By Michael Axler

On our subway motors, the nuts that hold the pinion on the armature shafts are made as shown in Fig. 1. The original nuts had four rectangular slots cut 90 deg. apart from each other on the edge of the nuts. These are shown by the solid lines. To remove or apply a nut, a wrench was used which had four projecting prongs which fit the four slots.

After a time in service, the pins would break off and would have to be replaced. The breakage was not excessive, and the wrenches and nuts were used for years. Then, we adopted pneumatically-operated impact wrenches for applying and removing the nuts. This is when our troubles started. The breakage of wrench prongs became intolerable. It was necessary to employ all the time of one man to repair wrenches.

To correct the trouble, a new wrench was developed as shown by the solid lines in Fig. 2. In the place of the rectangular prongs, we used standard No. 9 taper pins, driven into taper reamed holes, and held in position by a large nut on the back of the wrench. The pins are heat-treated and breakage is very low. When one does break, it is an easy matter to take off the nut, drive out the old pin, and replace it with another.

* New York City Board of Transportation, I.R.T. Division.

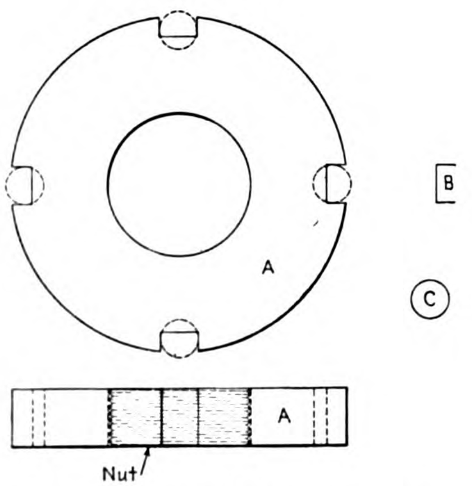


Fig. 1—Design of old and new pinion nuts

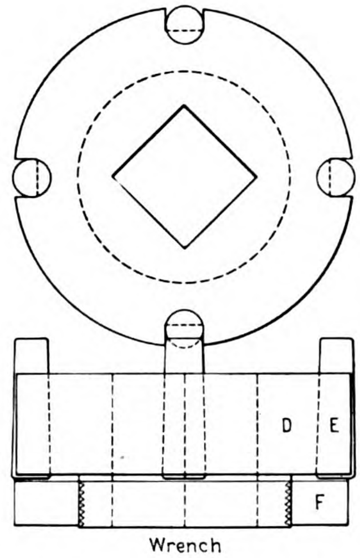
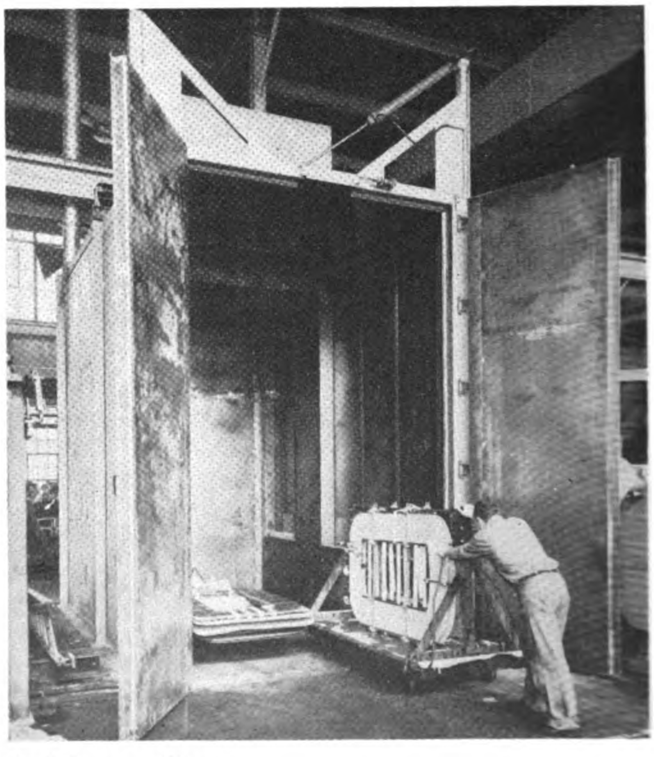


Fig. 2—Rectangular pins in the old wrenches were replaced with standard taper pins.

It was, of course, necessary to change all the nuts to match the new wrenches. Old nuts were cut out on an end mill as shown by the dotted lines in Fig. 1. New nuts are drilled.



Paul Bunyan Oven

Recently completed and now in operation is this huge varnish insulation curing oven at the Westinghouse Electric Corporation's manufacturing and repair plant in Buffalo, N. Y. Largest of its kind in western New York, it is 8 ft. wide by 13 ft. high and 15 ft. long. The oven is heated by either gas or electricity, and equipped with automatic controls to maintain constant temperature throughout. An air-changing system keeps the heat in continuous motion and results in effective evaporation and removal of varnish solvents.

What Tests For G.E. Governors?

The tester for G.E. diesel locomotive governors, developed by the Erie, and described in your December 1951 issue provides a simple and quick way of making tests. But, is it complete? Are there not other checks which need be made to insure satisfactory operation of the governor?

Test Stand for Governors on Alco-G.E. Locomotives

Any governor, after it is overhauled, should be thoroughly tested, including a running which simulates as closely as possible actual operation on the locomotive. The simulated operation should be fully comprehensive, duplicating, if possible, every set of speed and load conditions to which the governor is likely to be subjected in actual operation. This is imperative because it is far cheaper to find some obscure malfunctioning in the repair shop than to find it on a locomotive pulling 15 cars full of passengers.

The General Electric Type 17MG test stand (Fig. 1) provides for such testing of the Type 17MG3 and 17MG6 electro-hydraulic governors used on Alco-G. E. road locomotives. Its several components duplicate very closely the operating characteristics of the locomotive power plant, and thus simulate very closely actual locomotive operation.

As shown in the block diagram (Fig. 2) the governor on the test stand controls operation of an air motor which drives a tachometer and a small d.c. generator. The test stand is also equipped with an oil system for supplying pressurized oil to the governor; a motor-amplidyne set for exciting the d.c. generator; and a control panel. The control panel contains starting switches, generator load rheostats (and generator loading resistors mounted in the back), and the various gages and instruments.

Description of the Test Stand

The hydraulic system on the test stand is made up of a 10-gal. oil tank, an oil pump driven by a ¾-hp. a.c. motor, an oil filter and associated piping. Several gate valves, a pressure relief valve and an oil pressure gage are used to enable testing of both MG3 and MG6 governors. All valves are accessible at the front of the test stand in order to be convenient for the operator as can be seen in Fig. 1.

The source of power on the test stand is a 1½-hp. air motor. This air motor together with the air throttle valve have characteristics which are very similar to those of the diesel engine. Actually, it has less inertia and thus the test stand checks governor performance to a greater degree than is required for the diesel engine. Directly connected to the air motor is a 125-volt, 500-watt, d.c. generator which corresponds to the traction generator on the locomotive. Driven by means of a pulley on the air-

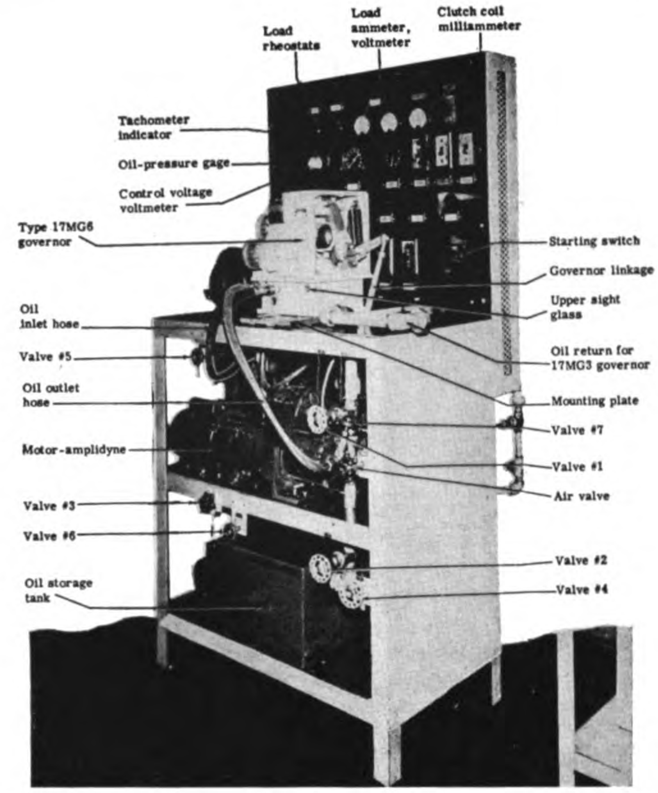


Fig. 1—Test stand for 17MG3 or 17MG6 governors showing 17MG6 governor mounted for testing

motor shaft and a V-belt, is the tachometer generator. This generator is a duplicate of that used on the Alco-G. E. road locomotive. A motor-amplidyne set is used to excite the generator on the test stand. Although this amplidyne is driven at constant speed by the a.c. motor, it has similar characteristics to the amplidyne exciter used on the locomotive.

The panel on the test stand contains all meters and necessary electrical controls. Two load rheostats are connected across the output of the generator and are used to vary the load applied to the system. The load ammeter and voltmeter are used to measure the generator output and thus determine the power which the air motor is producing. A heostat and milliammeter are used in the governor-clutch-coil circuit for checking the holding power of the clutch arms. The clutch-coil current may be reduced to the minimum value encountered on the locomotive when engine cranking is taking place. This, of course, is the condition in which holding power of the clutch arms is critical, since the battery voltage is low. A rheostat in the speed-solenoid circuit is used to vary the air-motor speed. This speed is shown in r.p.m. on the tachometer indicator. The 100-volt, d.c., voltmeter is used to measure control voltage. It is essential that this voltage be held constant throughout the test. A rheostat in the amplidyne field circuit is used to vary generator field current and thus generator output. Various other switches used to energize the oil pump, motor-amplidyne set, control circuits, etc., are also located on the panel.

The use of the test stand can be better visualized by a

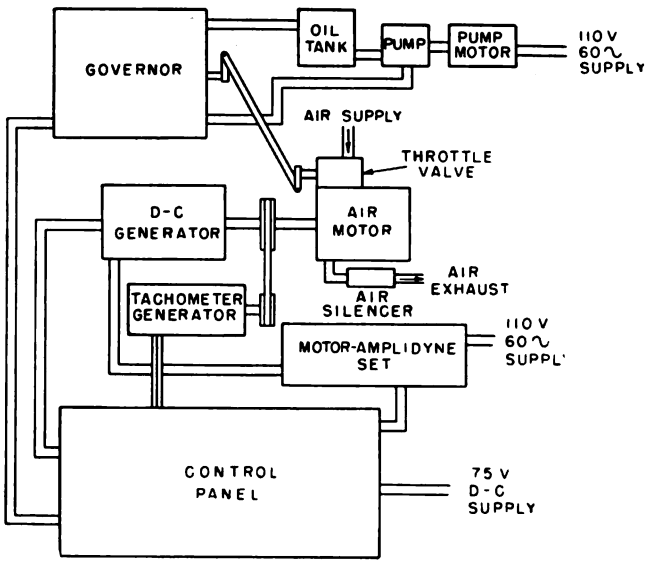


Fig. 2—Block diagram of governor test stand.

brief descripture of the testing procedure followed on all governors.

Preliminary Checks.—A resistance check of the following elements is necessary to assure that there are no open circuits or shorted turns. These measurements must be taken with a Wheatstone bridge to be of any value.

Item	Resistance Ranges
Clutch coil	362 -412 ohm
Speed winding	15.2- 17.3 ohm
Stabilizing winding	49.5- 60.5 ohm
Fuel limit speed winding	15.2- 17.3 ohm
Stabilizing rheostat	112.6-124.4 ohm
Load control rheostat	10.2- 11.2 ohm
Fuel limit rheostat	166 -184 ohm

The brush arms are set and this setting later verified by performance in the running test. The overtravel spring wind up must be checked to assure that no binding or excessive friction is present.

Static Tests.—After the governor is wire checked and a resistance check made of all governor circuit elements, it is bolted to the mounting plate on the test stand. The oil lines are connected to the governor and the test-stand valves are adjusted in order to provide the proper hydraulic system for the type of governor being tested. After oil pressure is obtained and the oil temperature reaches the operating range, the pressure regulator is adjusted. The oil pressure must be set for 125 to 135 lb. per sq. in. to assure that correct slave-piston response is obtained. This is followed by a thorough inspection of the governor for leaks. The stabilizing, load control and fuel-limit brush arms are next adjusted on the governor. The test-stand amphenol receptacle is then connected to the governor plug and the clutch arms are brought together and checked for fit. The next test involves the installation of a special pointer on the output shaft of the governor and checking the degrees rotation of this shaft throughout its complete travel. This test assures that proper rack travel is obtained on the diesel engine. Tests are made on the clutch arms to assure a close fit between the mating surfaces. Several clutch-coil tests are made which involve testing for minimum holding torque with reduced current passing through the clutch coil. A check of residual holding torque is made to assure that the arms will separate and shut down the diesel engine when necessary. All of these tests are made without the use of the air motor.

Running Test.—The running test is very important since the balancing current is properly adjusted in the speed and fuel-limit solenoids during this test. The no-load check at all speeds verifies that smooth operation is attained with freedom from hunting. Operation with various percentages of load simulates actual road conditions and the speed indicator will show that the pre-set speed is held during these conditions.

The output shaft of the governor is connected to the air throttle valve by the mechanical linkage. With 75 volts applied to the control circuits, the air motor is started by means of the starting switch. The governor controls the speed of the air motor as dictated by the setting of the speed rheostat. The speed- and fuel-limit solenoid currents are next adjusted during this no-load running test. Operational checks at various speeds throughout the entire range are then made. With the motor-amplidyne running, load testing is started. By closing the amplidyne field circuit and adjusting the field rheostat and load rheostats, any amount of load may be obtained. This phase of the testing is very important since no-load and full-load speeds may be compared and any speed droop detected.

Hipot Test.—A high potential test of the governor will round out the testing. This would consist of applying 800 volts, 60 cycles, from a special high-voltage, low-power tester, for a period of one minute.

Since the above operations simulate any conditions of speed, load and fuel limit met in actual operation, it is evident that any G. E. governor which has been adjusted and tested on a type 17MG governor test stand will perform properly in service on the locomotive.

Trouble Shooting

In addition to routine testing of governors after overhaul, the test stand is valuable for trouble shooting. A governor which is operating improperly on the locomotive may be replaced with a governor known to be functioning properly. The ailing governor may then be put through its paces on the test stand and the locomotive can go on its way in revenue service.

Overhaul Facilities

In overhauling governors, there are two other main requirements besides the adequate test facilities as described above. One is a clean, dust-free area, and the other is adequately trained personnel. Many railroads already have dust-free rooms in their shops in which are located repair facilities for fuel-injection equipment and/or other type governors. The main requirements for personnel are an elementary knowledge of electricity and good mechanical ability. Attending the Alco-G. E. Locomotive School would give these personnel an excellent background in the equipment.

The decision of whether to rebuild governors locally or to return them to the manufacturer's service shop will usually depend on the number of units in service. Many railroads have found it economically justifiable to train governor specialists, provide dust-free rooms and purchase test stands. Other roads using Alco-G. E. locomotive have perferred to return their governors to regional renewal parts offices on a repair and return or unit exchange basis.

R. D. Beard
General Electric Company
Buffalo, N.Y.

EDITORIALS

The Car Man and Claim Prevention

Car supervisors and employees, play one of the most important roles in railroad claim prevention because they work in the department where the remedy for all car conditions responsible for freight loss and damage depends upon close inspection and prompt action. Claim prevention has received much attention in the past and much good has been accomplished, but, as usual in co-operative efforts where many men from different departments must be taught and stimulated to greater effort toward one common goal, the need for further intensive education seems never ending.

In this case, especially, the job is obviously not yet completed, for loss and damage claims seem to be on the increase, even more than could be accounted for by the depreciated dollar value of today. In 1951, for example, records indicate that American railroads paid roughly $99 million in loss and damage claims, or $11 million more than in the preceding year and over four times as much as the $24½ million paid in 1941, just ten years earlier. A little calculation shows that this really staggering loss during the calendar year of 1951 amounts to about $275,000 a day; $11,500 an hour; or $190 every minute.

In quoting these figures at a recent meeting of car men in St. Louis, H. H. Wills, superintendent of station and claim prevention, Missouri Pacific, said: "American railroads individually are awake to the situation and in all of the United States there is not a Class I railroad that I know of that does not have an organization devoting its entire time to claim-prevention activity. Practically all railroads have, in one form or another, inaugurated special claim-prevention campaigns and some roads have inaugurated teaching and training programs aimed not only at saving the terrific drain on their revenue but, even more important, providing a vastly improved service to customers."

In connection with work the Missouri Pacific is doing along this line by means of booster committees and special district five-man claims-prevention teams, it is interesting to note the major contribution made by a claim prevention instruction car which is mechanically cooled, supplied with 44 comfortable, tiered seats and the latest instruction aids, including loudspeaker, blackboard, moving pictures and slide projector. This car, with a self-contained power plant for lighting, heating, air-conditioning and other purposes, can be moved anywhere in yards or stations for holding instruction classes. Failures occurring at individual points are thus brought to the attention of the local men most interested and responsible. Causes are analyzed, preventive measures proposed and full discussion encouraged to develop all possible suggestions from men in the rnaks.

Mr. Wills points out that the effectiveness of general claims prevention work on the Missouri Pacific is shown by the fact that claim payments on this road dropped from $3,440,369 in 1948 to $2,722,628 in 1949; $2,013,452 in 1950; $2,482,200 in 1951. Car men undoubtedly helped much in this achievement for they are primarily builders and repairers and hence adverse to waste and destruction. By combining their knowledge of equipment conditions with the claim man's knowledge of damage causes, a strong team effort results.

Car men are supposed to keep freight cars clean and in good mechanical condition, but they can probably help most by such prosaic things as removing all nails and projections which tear lading; by making sure that floors are sound and smooth; by checking old classification cards and removing all trace of previous contaminating loads; by removing these cards each time a car is loaded or selected for loading; by restencilling illegible marks such as car numbers and weights; and working patiently with shippers whenever necessary to demonstrate safe loading methods for general as well as special loads and explaining the reasons of safety which make strict adherence to A.A.R. loading rules essential.

How Important Is High Availability?

Railroads today go to great extremes to achieve maximum mileage and availability from diesel power. They figure out complicated assignment cycles to get the last mile per month from each unit. They increase the lengths of locomotive runs even to the extent where a unit may end up a thousand miles away from its maintenance terminal at some point that cannot handle either efficiently or quickly any heavy work that might be needed after the long run. They go to the further extreme in some instances of changing train schedules for the primary reason of getting maximum locomotive mileage rather than maximum freight or passenger business.

After going to all this fuss and bother to get the last mile out of each diesel locomotive, many roads then fail to take the one final step necessary to achieve in practice the mileage set up on their paper schedules. They fail to keep on hand at turnaround terminals an adequate supply of new or reconditioned major assemblies.

It is true of course that the need for such a supply does not occur frequently enough to be a problem where a turnaround terminal handles only one make of diesel. Neither does it happen frequently to the make of diesel assigned to a point for heavy maintenance even though that point may give turnaround or other servicing to other makes of locomotive.

It can be a problem where two or more makes of diesels operate through between two points a consider-

able distance apart, say 500 to 1,000 miles, and where one make is given heavy maintenance at one end of the run and the other at the opposite end. The first receives its heavy maintenance at the north terminal but winds up on the south end with two defective cylinder assemblies. None are available, or perhaps only one.

The locomotive then must lay over until the necessary part or parts can be obtained from outside sources, shipped from the heavy maintenance terminal, or reconditioned at the local terminal which may not be too well equipped for handling this work rapidly on the make of diesel foreign to them. Or—and this can happen more often than records indicate—the defective unit is returned dead to its home terminal.

In any event more availability and more revenue miles can easily be lost by inadequate spare parts than can be gained by complicated assignment schedules, long runs or changed train schedules. How many mechanical departments have checked their records carefully to learn what the true picture is? It seems likely that the true picture will reveal that high availability and mileage will be best attained in practice as well as in theory when all maintenance points carry adequate spare parts inventories for all makes of locomotives with which they come in regular contact, including any that might be assigned to other locations for heavy maintenance.

Cleaning Generators in Place

It has been the ambition of nearly every diesel locomotive maintainer to clean main generators in place on the locomotive. Some generators need it a lot more than others. Some locomotives operate in dusty territory, some are subject to fine powdered snow, the trailing unit usually gets more dirt and heat than the others, and circumstances are seldom twice alike. But, there is certain to be some oily vapor in a locomotive. There is dirt from the outside, there is carbon-brush residue, and brakeshoe dust has a way of getting into everything. If the accumulation on the surfaces of the armature and brush rigging become sufficient, flashovers are almost certain to occur.

Regular practice of blowing out the generator with air will relieve it of a lot of accumulation, but it cannot remove dirt that is embedded in the insulation or held by an oil film. One road cleans with a blast of air and corn meal and removes the corn meal with the dirt that comes with it by using a 5-hp. vacuum cleaner. The suction nozzle is a piece of rubber hose. Other roads spray clean with various types of solvents and employ different methods of draining them out and drying them out with air. One operator feels that if he could do this often enough, beginning when the generator was new, he could keep it clean.

Others place more emphasis on the importance of keeping dirt out of generators; almost as much attention is given to body filters as to the engine air filters. On one passenger run, in very dusty territory, one railroad changes out the body filters on the third unit on every run. Others criticize such procedure, saying, "What's the use. If it's hot, the operators will run with the side and end doors open." Still other proponents of preventive maintenance have given much attention to air flow inside of the locomotive, redirecting it so that it enters at the generator and then moves across the engine.

The preponderance of operators hold the opinion that there is no royal road to trouble-free operation. It would appear from their experience that there is no substitute for intelligent inspection which includes the making of electrical tests. They feel that the only sure way to keep out of trouble when the insulation resistance begins to run down is to remove the generator from the locomotive and restore its condition.

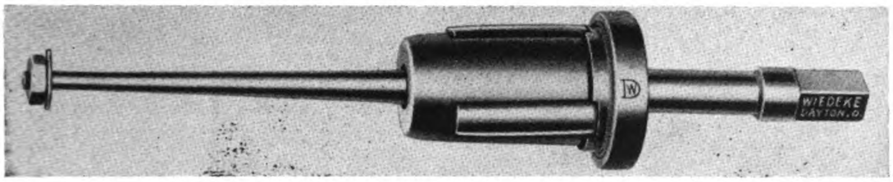
NEW BOOKS

HANDBOOK OF ENGINEERING FUNDAMENTALS. *Second Edition. Published by John Wiley & Sons, 440 Fourth avenue, New York 16. 1,324 pages, 5½ in. by 8 in. Leather bound. Price $10.*

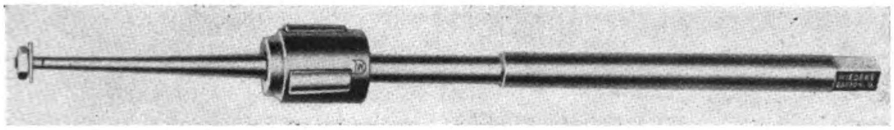
The discussions on mathematics, thermodynamics, and fluid mechanics have been entirely rewritten or revised in this new edition of the Handbook which has been prepared by a staff of specialists under the editorship of Ovid W. Eshbach of the Northwestern Technological Institute. The sections on electricity and magnetism, engineering materials, and engineering law have been similarly revised, and a section added on aerodynamics stresses theory basic to the design and performance of aircraft. Engineering tables now include standard structural sizes for aluminum, as well as data on tangents and offsets for the use of civil engineers. The table on standards and symbols has been brought up to date, and tables added for surveyors. Greater emphasis has also been given to the MKS system of units which has been incorporated in the table of conversion factors.

STANDARD PRACTICES FOR STATIONARY DIESEL ENGINES. *Third edition. Published by Diesel Engine Manufacturers Association, 1 North LaSalle street, Chicago 2. 197 pages, 6¼ in. by 9 in.; illustrated. Cloth bound. Price, $5.*

This book is the product of member companies of the Diesel Engine Manufacturers Association which coordinated their engineering and sales departments and delegated representatives to revise the 17 chapters of the 1946 edition. Sections dealing with dual fuel engines, operation and maintenance, and starting systems have been added, also new material in an appendix. The chapters of the new edition cover Definitions; Performance and Equipment; Diesel Engine Construction; Governors and Speed Regulations; Torsional Vibrations and Critical Speeds; Intake and Exhaust Systems and Heat Recovery Apparatus; Starting Systems; Cooling-Water Systems; Lubricating-Oil Systems; Fuel Storage and Handling Systems; Generators and Electrical Equipment; Selection of Engine Sizes; Diesel Power Plant Buildings; Erection of Diesel Engines; Lubricating-Oil Characteristics and General Specifications; Field Test Code; Suggestions Covering the Preparations of Invitations for Bids and Detailed Specifications, and Operation and Maintenance.



Expander A



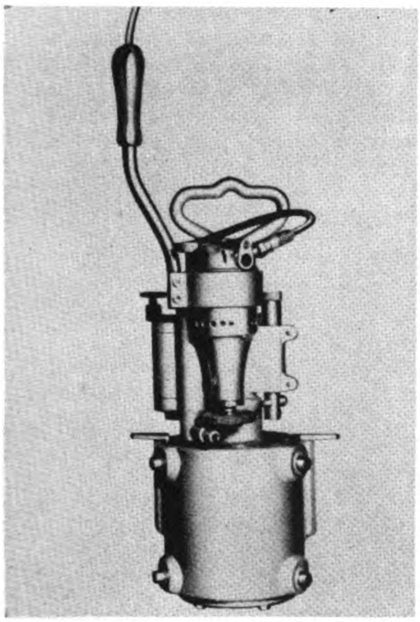
Expander B

Cylinder-Head Sleeve Expanders

The Gustav Wiedeke Company, Dayton 1, Ohio, has designed two new Ideal expanders to roll both ends of a diesel cylinder sleeve parallel in a cylinder head.

Expander A is used for the upper end of a cylinder head. It has an inset shoulder to position cylinder sleeve while rolling.

Expander B is for the lower end of a cylinder head sleeve and is suitable to reach through and expand tube parallel to the cylinder head. It automatically positions itself for rolling.



Portable Ridge Grinder

A portable ridge grinder that grinds true to the worn contour of cylinder liners has been developed and introduced by B. K. Sweeney Mfg. Company, Denver 17, Colo.

It is claimed that this device feathers-out the ridge so that pistons and rings can be readily withdrawn through the top of the cylinder.

The tool can be used to remove ridges from either chrome-plated or cast-iron liners in less than three minutes. It is adjustable to fit any size liner from 7⅞-in. to 16-in. inside diameter. Units can also be furnished to fit any size work up to 25-in. inside diameter.

A built-in wheel dresser provides for wheel dressing without removing the grinder from the work surface. Total weight of this portable device is 32 lb.

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Hard Shell Cup Grinding Wheel

A cup grinding wheel which retains its sharp cutting edge throughout its service life has been announced by the mechanical goods division, United States Rubber Company, New York 20.

The wheel has a hard shell of tough resin-bonded abrasive built around a core of rapid-cutting resin-abrasive construction. This shell, which is 3/16 in. thick, resists mushrooming or rounding of the wheel's cutting edge. Wear occurs evenly across the entire face of the wheel. It is particularly useful for grinding accurately hard-to-reach corners and complicated shapes, and is applicable in welding, foundry operations, finishing welds and machine shop work.

The wheel, marketed under the trade name U. S. Royalite hard-shell cup wheel, has an overall diameter tapered from 6 in. to 4¾ in. and a thickness of 2 in. It is available for three standard types of arbors.

A Chemical-Resistant Paint

Ferrolastic chemical resistant coating, a product of McDougall-Butler Company, Inc., 2929 Main Street, Buffalo 14, is formulated with a resin, the outstanding characteristics of which are adhesion, flexibility and chemical resistance. These features have indicated substantial savings both in labor and material when used on covered hopper and tank cars subject to corrosive action from such lading as soda ash, cement, liquid chlorine, and other alkalis.

Good chemical resistance was observed in tests conducted in the laboratories of four large eastern railroads. In actual service tests the coating was found to combat successfully the damaging action usually resulting from spillage. The finish of covered hopper cars used in cement and soda-ash service is said to be in excellent condition after 1½ years' service. Tank cars in liquid chlorine service also present good appearance and durability after 17 months.

Because of its exceptional adhesion, no primer is required, so that two coats of Ferrolastic are usually sufficient to obtain adequate metal protection. It can be applied over a wire-brushed surface without sand-blasting or removing old finish, and can be hot sprayed at 170 deg. F. The coating has all the characteristics of an ordinary synthetic enamel—gloss, durability, and dry.

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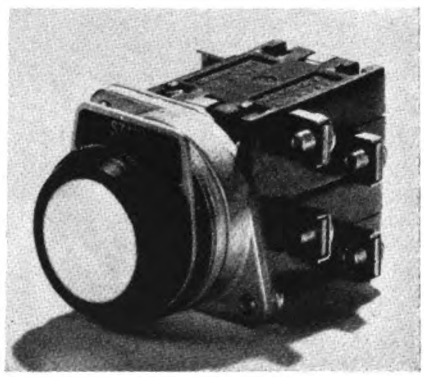


Oil-Tight Pushbuttons

A new line of oil-tight pushbutton units for machine tool applications was announced recently by the General Electric Company's Control Department, Schenectady, N. Y.

The units, made up of operators, color rings and contact blocks may be arranged like building blocks in various combinations.

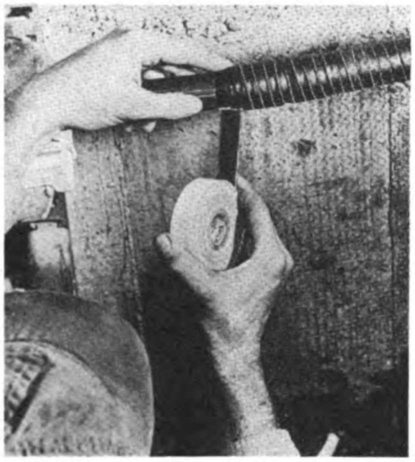
Coding of pushbuttons with the new color rings—available in brilliant, permanent shades of black, red, green, yellow, and white—is accomplished by screwing the ring onto the neutral-colored button. Be-

cause the color identification is on the ring, away from the area of use, it does not become discolored from dirt and grime. Also, the larger color surface can be seen more easily by the operator.

New "self-a-line" double-break contacts are placed at an angle so they close with a rolling action. Only one basic form of contact block is used in the new units—a single-pole, double-throw type made of Melamine for maximum arc resistance. Double-pole, double-throw combinations are made by mounting two of these units on the same base, and tandem combinations giving up to four normally-open and normally-closed contacts can be made by combining four blocks with an adapter plate.

The aluminum enclosures meet all J.I.C. specifications and are finished in machine-tool gray. Offered with 1, 2, 3, 4, 6, and 9 button stations, they are fully oil-tight. Depth of the unit is 3 7/32 in., and a standard pushbutton extends 1/2 in. beyond case. Other dimensions depend upon the number of stations in the unit. Contacts are rated at 115, 230, 460 and 575 volts.

◆



Oil-Resistant Filler Tape

An oil-resistant tape for rapid insulation build-up on splices in large power cables has been announced by Minnesota Mining and Manufacturing Co., 900 Fauquier street, St. Paul, Minn.

Designated "Scotch" brand electrical tape No. 25, it is made of synthetic rubber providing greater dielectric strength and resistance to high temperatures than natural rubber tapes.

The chemical-resistant qualities of the tape make it especially suitable for use in oil drilling, mining and underground cable operations, while the 40-mil thickness and extreme stretch (1,500 per cent breaking point) make possible smooth insulation wraps on irregular surfaces.

Dielectric strength is 15,000 volts unstretched, and 10,000 volts at 500 per cent elongation. It has an electrolytic corrosion factor of 1.0 and an insulation resistance of 100,000 megohms.

The tape is available in 3/4-in. by 15-ft. rolls, is green-colored, and has a white strippable liner to be removed before use.

Since it fuses to itself, forming a solid homogeneous mass, it requires no adhesive. The tape is not designed as a sole insulation. "Scotch" plastic electrical tape No. 33 is recommended as the outer wrap for protection against moisture, weather, and abrasion.

◆

Diesel Control Circuit Jumpers

Control jumpers for diesel-electric locomotives are now being made by the Pyle-National Company, Chicago. They consist of a 250-volt multi-conductor cable and two plug heads molded in Hycar, a product of the B. F. Goodrich Chemical Company. The cable and plug heads are vulcanized together to form a one-piece unit, which sometimes incorporates as many as 27 circuits. The plugs, each 5 3/16 in. in diameter and 9 7/8 in. long, are shaped to permit a comfortable hand grip and are designed to absorb the flexing strain imposed on the cable during operation.

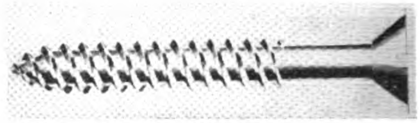
Rough handling and dragging on the railroad bed when disconnected make it necessary to use a durable material to protect the plug head contacts. Besides having good abrasion resistance, Hycar resists the damaging effects of coal dust, salt-water spray, greases, most acids, human waste, and is not affected by weather or extreme temperature changes.

◆

Parallel Side Wood Screw

A new type of wood screw, designated the Twinfast, is now being produced by the Townsend Co., New Brighton, Pa. This product has two threads with twice the pitch and drives twice as fast as a conventional wood screw

With a single, centered point, the screw



affords quick starts and balanced driving. It has parallel sides, is not tapered, and therefore has more thread area in contact with the material for more holding power. The shank or unthreaded portion is the same diameter as the thread pitch.

The screw is made of steel or brass in all standard sizes with flat, round and oval heads—slotted or Phillips cross-recessed.

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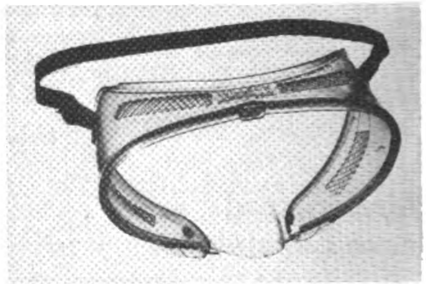


All-Plastic Safety Goggle

An improved, all-plastic safety goggle manufactured by Willson Products, Inc., Reading, Pa., has a flexible, fully transparent frame molded of Vinylite. Although the frame comfortably conforms to all facial contours, a newly designed lens retaining feature adds sufficient rigidity to the frame so that there is no sacrifice of protective efficiency. The lens is of .060-in acetate, and is separately replaceable. The goggle, known as the Willson No. 91 MonoGoggle, weighs just over an ounce and fits easily over all types of prescription glasses.

◆

Terminal Block

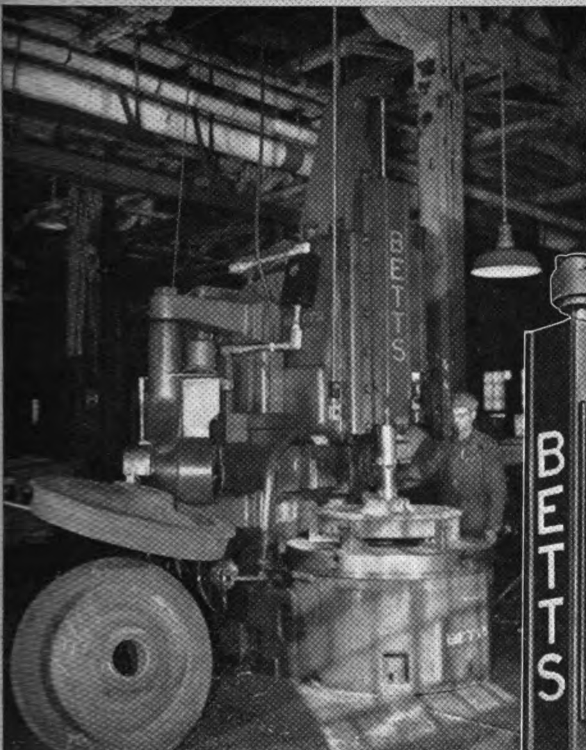
A terminal block, known as the Curtis FTB, has been developed by the Curtis Development & Manufacturing Co., 3266 North 33rd street, Milwaukee 16, for quick connect and disconnect requirements in experimental work. The block is similar to the FT type, used for sub-panel and

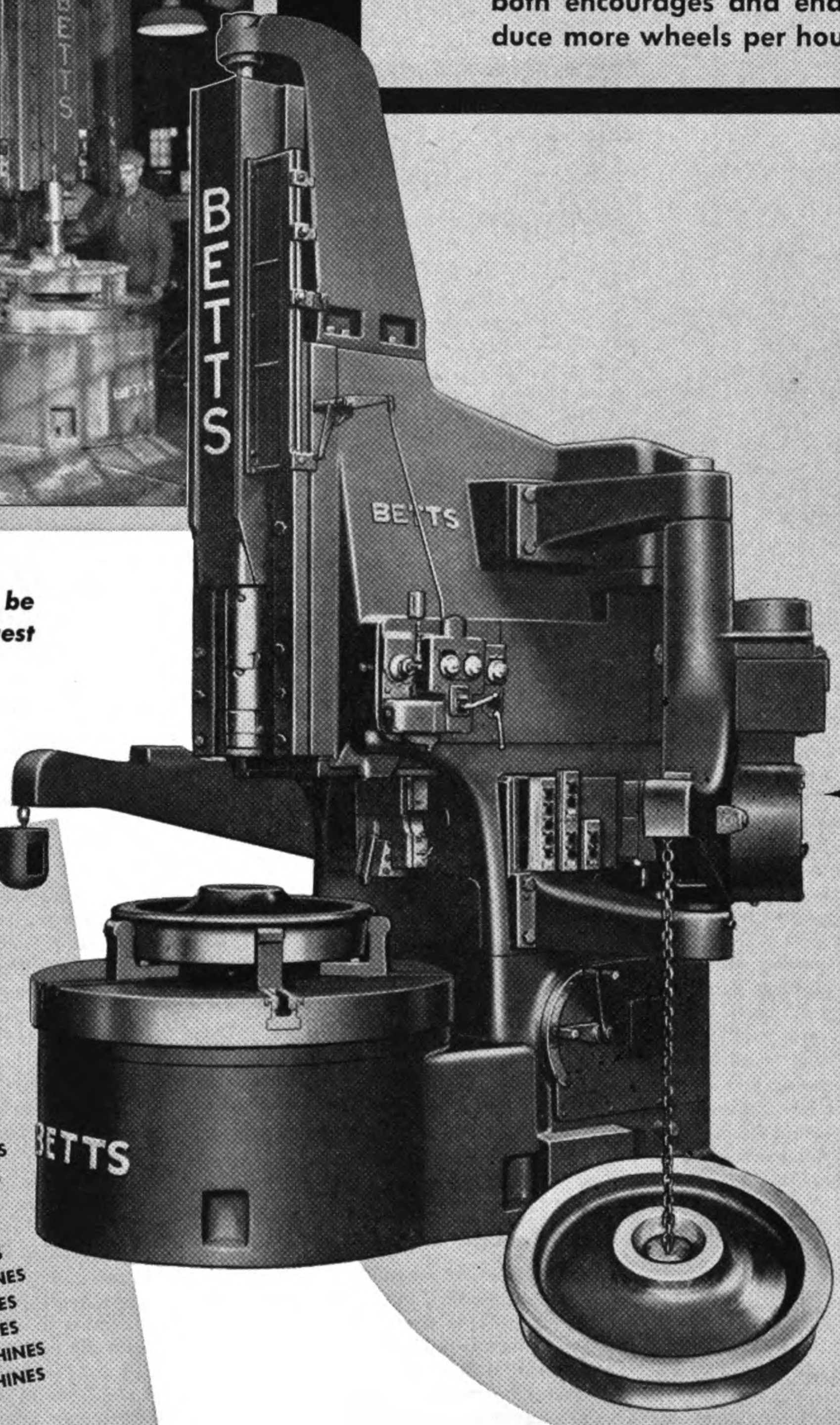
BETTS HYDRAULIC FEED CAR WHEEL BORER

It's the average daily wheel production that counts . . . .

not a dress parade run of an hour or a day

This modern machine's simple, automatic operation both encourages and enables the operator to produce more wheels per hour . . . day in and day out.





Full information will be furnished upon request

Full automatic cycle from loaded start to stop, controlled through trip dogs with supplementary manual operation at any point in the cycle.

Wide speed range for use of either high speed steel or carbide tools with automatic speed reduction for combination roughing and high speed steel finishing.

Chuck jaws independently adjustable on sub-bases, eliminating frequent regrinding to maintain accuracy.

Boring sizes up to 12″ diameter. Wheel tread diameters up to 48″.

Available with either flange mounted or taper shank type boring bar.

Automatic brake stops table before spindle traverses upward, preventing scoring of the work.

Square-type ram with adjustable gibs on each side for maintaining constant, close accuracy. Hydraulic cylinder in line with boring ram.

Among Railroad Tools built by Consolidated are . . .

CAR WHEEL BORERS
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TIRE MILLS
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CENTER DRIVE AXLE LATHES
JOURNAL TRUING LATHES
DRIVING WHEEL LATHES
CAR WHEEL LATHES
RADIUS LINK GRINDERS
PROFILE MILLING MACHINES
SLAB MILLING MACHINES
ROD MILLING MACHINES
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BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

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CONSOLIDATED MACHINE TOOLS

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MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED. ATTA

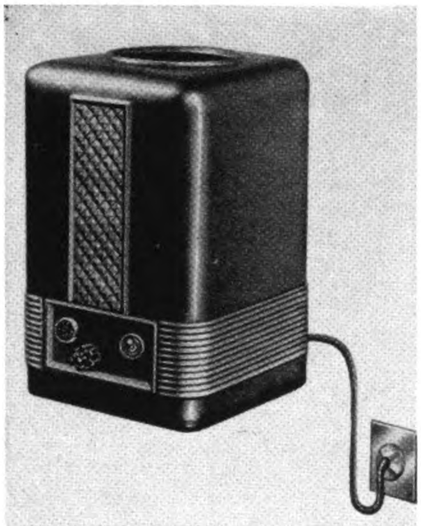
ROCHESTER, NEW YORK

chassis work. It is of the feed-thru type with solder or screw connections on one side and provisions to receive banana plugs on the other. Banana plugs are not furnished with the FTB block.

The unit is factory assembled in any number from 1 to 16 terminals, which are separately insulated and held permanently in a metal strip.

The FTB is conservatively rated at 300 volts between terminals of opposite polarity and to ground—20 amps.

◆



Insect and Odor Destroyer

Hysan Products Company, Chicago, has announced a machine, called the Hy Tron, that combines odor and insect control. It is designed to destroy odors and kill flying insects simultaneously and by throwing a switch, it can be made to perform either of these functions separately.

The machine is equipped with an electric fan for delivering freshened air and a heating element that vaporizes a Lindane-based insect tablet for killing flying insects. It is fused so that it meets Health Department and other state and federal safety requirements. It has a pilot light that tells when it is operating and a thermostat for automatic control. A bracket is furnished for use when the unit is to be mounted on the wall. A hinged back door may be opened with a key for replacement of the air freshener.

The unit may be touched without fear of burning fingers or hands.

◆

High Capacity Petroleum Meter

Suited to bulk plants and terminals, this new 4 in. Red Seal Meter, manufactured by the Neptune Meter Co., New York 20, offers the Auto-Stop delivery feature. It is compact, lighter in weight and fits practically any piping layout. There is only one moving part in the oscillating piston type measuring chamber.

The Auto-S op automatically cuts off

flow at the desired gallonage. Designed for low loss of head, the valve is cushioned with a double trip to cut off high rates of flow smoothly. Capacity of the type C meter is 650 gal. per min. without Auto-Stop, 500 gal. per min. with it. Print-O-Meter ticket printing registers are also available.

This meter is available with four types of weatherproof registers: model 441, direct reading; model 442, Auto-Stop; model 443, Print-O-Meter; and model 444, Auto-Stop Print-O-Meter. It is also available with the Neptune remote control system to put full control inside the office.

◆

Tong Test Volt-Ammeter

An instrument for measuring both current and voltage, called the Type AC-1 volt-ammeter, is being made by the Columbia Electric Manufacturing Company, Cleveland, Ohio. It is a clamp-type, hand-sized measuring instrument. Current readings are made without breaking circuit or insulation. To read amperes, the trigger is pressed, opening the pair of insulated jaws so that they can be encircled around the power cable or bus bar. The jaws will accommodate cables up to 1½ in. in diameter, and bus bars up to 2 in x ½ in. Four current ranges are available: 0-12, 0-60, 0-120 and 0-600 a.c. amp.

Voltage leads may be quickly and safely plugged into the handle of the instrument. Two voltage ranges are available—0-150 and 0-600 a.c. volts. The instrument weighs less than two pounds. Overall dimensions are 11 in. x 3½ in. x 1⅞ in.

The trigger and housing of the instrument are constructed of a durable molded phenolic material. Accuracy is plus or minus 3 per cent of full scale deflection. The complete unit includes voltage leads and carrying case.

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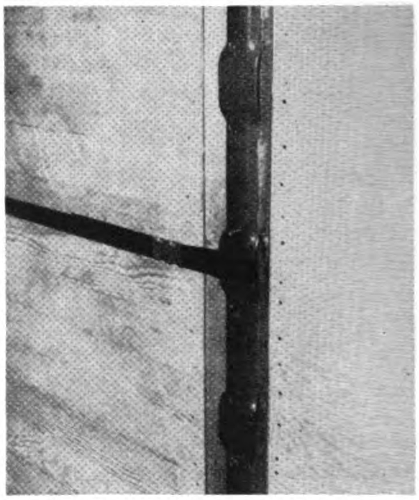


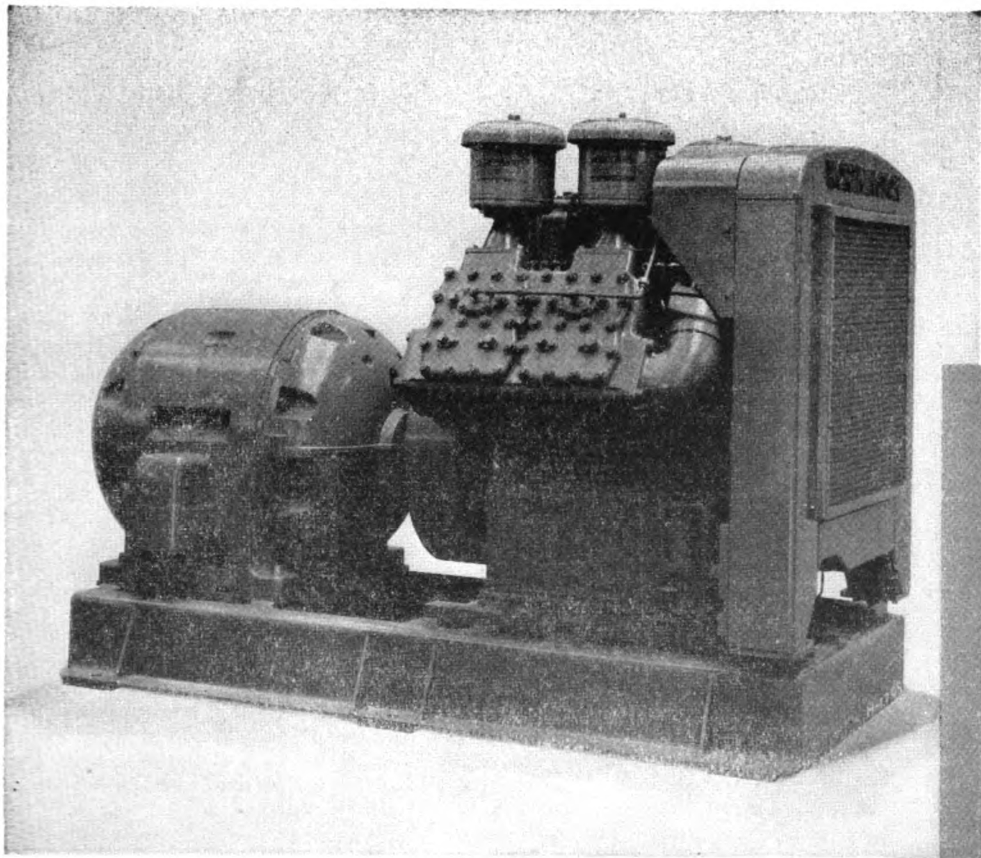
Lading Strap Anchor

A full length intermediate lading strap anchor which can be used in conjunction with existing door post anchors has been developed by the Pullman-Standard Car Manufacturing Company of Chicago. With this device for reducing side lining damage, shippers can anchor unit loads with high weight and small volume to box cars without nails, and they can also use the lading strap anchor with temporary bulkheads for other types of shipments.

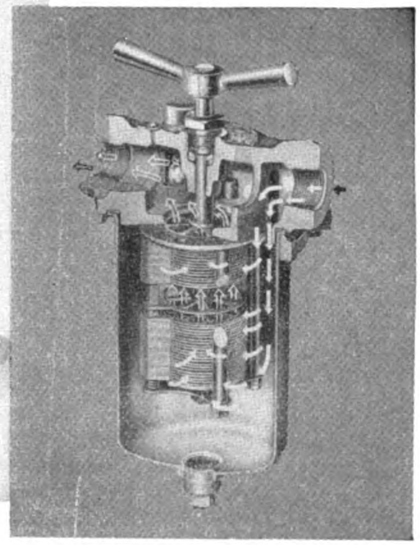
The new Pullman-Standard Lading Strap Anchor for intermediate posts keeps box car linings and floors nail-free. It thereby eliminates hazards to personnel, lading and equipment, as well as costly repairs to linings and floors when temporary anchoring devices are used.

The anchor is recessed into a slot in the lining so that the exterior is flush with the side lining to avoid catching lading or denting cartons. It extends the full height from the floor to the roof and has approximately 13 locations for fastening straps. The number of anchors to be installed per car and the points of installation are determined by the needs of the road involved and the types of lading to be secured.

The anchor does not interfere with side lining replacement, and it can be removed and replaced without disturbing side lining. The anchor further can be easily replaced or repaired, if damaged in service, using common bolts or nuts. No concealed welding or special fasteners are used. The side lining installation is not weakened; full width lining boards can be securely



CUNO AUTO-KLEAN FILTER (below) part of force-feed lubrication system that saves 25-50% on lubrication costs of Worthington Radial Compressor (left). No mere screen for this filtering job, but a special unit that removes small as well as big particles. Filter is cleaned by a single turn of the handle; needs no renewal cartridge.



Another big reason why Worthington Radial Compressors perform better and longer

Compressed air—for charging brake systems, for general shop service, or many other needs—as quickly as you need it . . . whenever you need it . . . at lowest possible operation and maintenance costs.

Where do you get it?

Users everywhere will tell you that it comes from Worthington Radial Air Compressors. Ask them why these hard-working units give them this economical day-in, day-out performance and they'll give you reason after reason.

Take Worthington's force-feed *filtered* lubricating system with the Cuno Auto-Klean oil filter. Worthington Radials don't depend on a mere small screen to protect moving parts against carbon or other oil contaminants. The Auto-Klean filter removes small as well as large particles, saves 25-50% on lubrication costs, and is just one of the Worthington features that add up to longer life and smoother operation.

Other important features: Worthington's airplane-type connecting rods. Fan cooling of isolated cylinders. Fully counterbalanced crankshaft, ground and polished . . . Timken main bearings . . . the famous Feather* valve. Broad range of capacities: 25-100 hp with piston displacements from 142-538 cfm.

Write for bulletin to Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Vertical Compressor Division, Holyoke, Massachusetts.

*Reg. U. S. Pat. Off.

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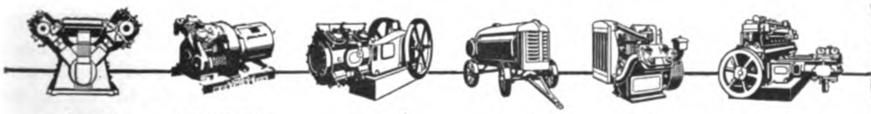


Y-TYPES | BALANCED ANGLE | HORIZONTAL | PORTABLE | RADIAL | GAS ENGINE COMPRESSORS

No Other Compressor Will Outperform a Worthington

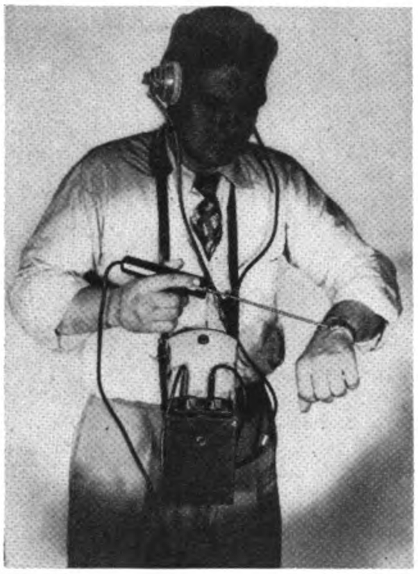
WORTHINGTON

Compressors

nailed to separate nailers on each side of the anchor.

The guide plate on either side of the anchor has sloping surfaces to guide the steel strapping through the anchor. The anchor itself has rounded edges to prevent damaging the strapping by sharp bends.

◆



Electronic Stethoscope

The Elec-Detec is an electronic instrument designed for use by maintenance men in locating noise sources in bearings, cams, clutches, differentials gears pipe lines, etc. It has been marketed by the Anco Instrument Division American Name Plate & Mfg. Co., Chicago 24.

The device consists of a metal probe, with an electronic amplifier and selector housed in a handy carrying case, and a set of headphones. The metal probe handle contains a microphone that transmits impulses electrically to earphones through the amplifier. Two adjusting knobs on the housing provide volume control and sensitivity.

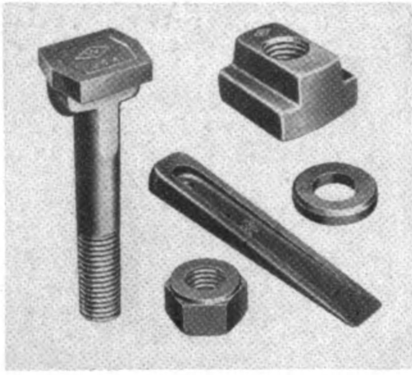
When the probe is placed in contact with a suspected source of noise, the sound vibrations are amplified many hundreds of times so that the exact source of trouble can be pin-pointed immediately. By manipulating the sensitivity control, the operator can identify the sound and analyze its cause.

◆

Machine Set-Up Accessories

In addition to a complete line of strap clamps, J. H. Williams & Co., Buffalo 7, has added T-slot bolts, nuts and flat washers, T-slot nuts and set-up wedges to their line of set-up accessories.

These accessories are used for setting-up work on planers, shapers, milling machines and other similar applications. All are made from a superior grade of steel to



withstand severe machine shop use. Williams T-slot bolts, which it is said, will not turn in machine table or break out machine table slots, are available in 3/8-, 1/2-, 5/8-, 3/4-, 7/8- and 1-in. T-slot sizes in a wide range of lengths.

◆

Grating Spectrograph

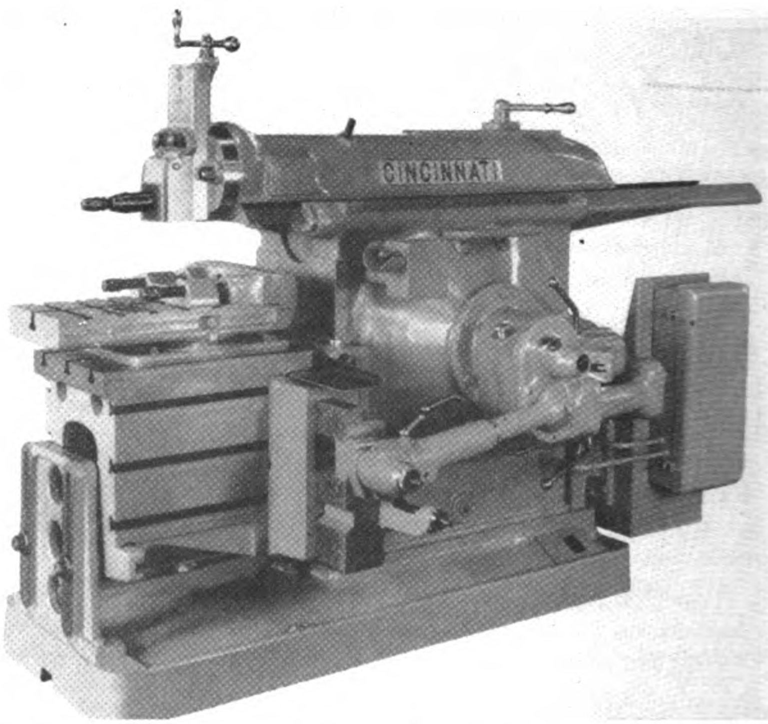
A new device for spectrochemical analysis, the grating spectrograph, which receives the light emitted by a specimen, sorts it into its component wavelengths, and makes a permanent record of the resulting spectrum on film has been introduced by Baird Associates, Inc., Cambridge 38, Mass.

This unit has the ability to perform qualitative and quantitative spectrochemical analysis. It is applicable for railroading work, especially for sludge analysis. In analyzing crankcase sludge of diesel locomotives, significant savings can be obtained according to the instrument's manufacturer.

Periodic checks of engine condition can be ascertained giving precise information as to when a given engine should be overhauled. At intervals, samples of the sludge are removed and reduced to an ash and analyzed by the device.

A correlation of this sludge analysis with data on operating conditions can be valuable in experiments in the study of influence of horsepower on rate of wear, the effect of idling, temperature, fuels, filtration and lubrication on wear.

Made in two designs, the 3-meter unit has an overall length of 15 ft. 8 in., depth of 2 ft. 2 in., and a height of 5 ft. 2 in. The 1-meter unit stands 8 ft 10 in. long, is 2 ft. 11 in. deep, and is 5 ft. 2 in. high. It requires a maximum of 350 watts at 115 volts, 60 cycles.



Magnetic Clutch and Brake

The inconvenience and maintenance problems of the old style mechanical clutches and brakes are largely eliminated with the introduction of the electromagnetic clutch and brake. This equipment, manufactured by the Cincinnati Shaper Co., Cincinnati 25, Ohio, is now standard apparatus on its shapers.

This device makes possible instant starting and stopping with a single fingertip control lever. The ram can be positioned quickly for setting tools by the instant action of the clutch and brake.

It operates without a grab. Adjustment of the clutch or brake is not required for the life of the friction surfaces—estimated to be 15 years of normal operation. Torque remains constant throughout operating life.

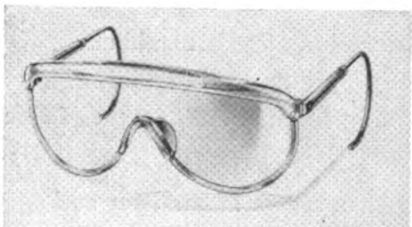
Snap-Around Volt-Ammeter

Pyramid Instrument Corporation, Lynbrook, New York, has announced its Amprobe No. 600, the latest model to be added to its line of snap-around volt-ammeters.

Model "600" combines the six ammeter ranges and three volt-meter ranges in one pocket-size instrument: 0-15/30/60/150/-300/600 amps. a.c. and 0-150/300/600 volts a.c.

Like its predecessors, it measures current instantly without need of interrupting the circuit or shutting down equipment. Six improvements are incorporated. A doughnut-type transformer eliminates, for all practical purposes, the factor of error due to position of conductor within probe jaws. There is fingertip selection for the 9 ranges. The voltage test lead plug is automatically insulated by a snap-out sleeve when removed from meter. Probe jaws completely insulated. There is a high-visibility no-rim window and the instrument is pocket-sized, belt-mounting.

◆

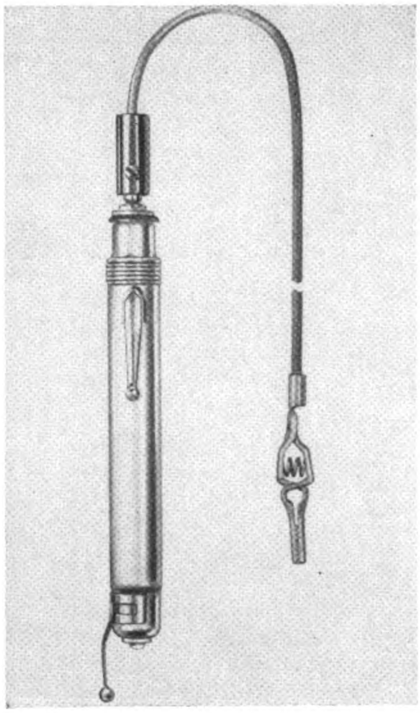


Safety Goggle with Plastic Frame

A safety goggle, featuring a transparent plastic frame which provides a greater field of vision, is announced by American Optical Company, Southbridge, Mass.

The goggle is designed and recommended for wear directly over the eyes or over spectacles. It is particularly useful for frontal protection against foreign particles on machine and hand tool work, chemical and physical laboratory work, spot welding, light grinding, light chipping and light riveting.

◆



Continuity Tester

A pocket-size continuity tester is being added to the line of electricians' tools manufactured by Ideal Industries, Inc., 1561 Park avenue, Sycamore, Ill. It is designed to determine continuity of circuits and identify wires between terminals or in multi-wire cable, as in switchboards and control panels.

The tester permits testing of circuits without the need of live wire connections, as it provides its own power from pen-lite batteries. It may be used in noisy areas, because it uses a signal light indicator which illuminates the point of contact. It requires only one hand, leaving the other hand free to hold circuit diagrams or blueprints. No larger than a pen-lite flashlight, this sturdy little tester will find many uses by electricians, building and plant maintenance men and also on many production lines.

It is equipped with a four-foot cord and alligator clip. When not in use the test lead is detached eliminating any chance of exhausting the batteries.

◆

Molded Glass Laminates

A series of low-pressure laminates have been developed by Dow Corning Corp., Midland, Mich. Molded of glass cloth and silicone bonding resin at pressures from 3 to 30 psi., they will withstand continuous exposure to temperatures in the range of 500 deg. F. and intermittent exposure to as high as 900 deg. F.

These finished laminates with a mechanical strength superior to silicone bonded moldings weigh less than aluminum or magnesium and are stronger than either at 500 deg. F. according to the manufacturer. Smooth and non-porous, they are water repellent and resistant to most commonly used chemicals. Laminating stocks may be performed and used to prepare complex shapes either by bag molding or in light metal molds. Flat sections can be laminated in thicknesses ranging from 0.01 to 2 in.

The organic resins, used in the older manufacturing process were useful only at operating temperatures below 350 deg. F. For service at higher temperatures, the low-pressure silicone-glass laminates were developed by Dow. Press time for these laminates is only 15 min. for an ⅛ in. section.

◆

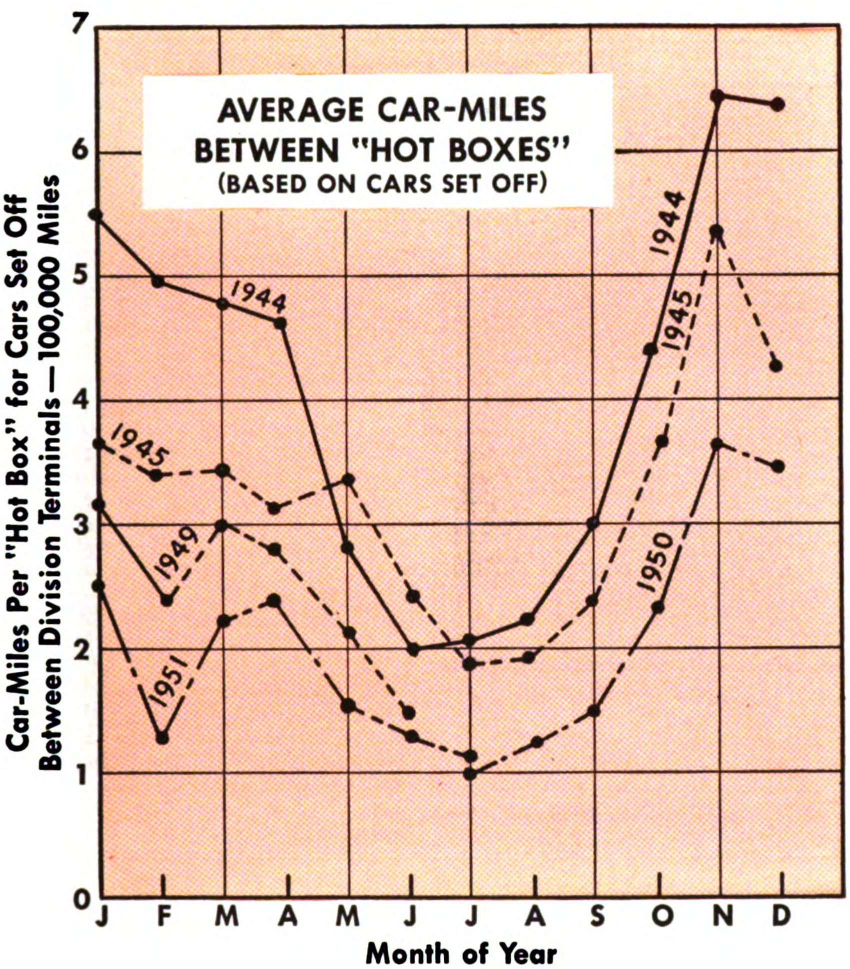
Semi-Automatic Compound Dispenser

A semi-automatic unit for feeding water treatment compounds to locomotive systems has been marketed by The Bares Company Cleveland 3, Ohio.

This system is in reality a safety dispenser. It is located inside the cab of steam and diesel locomotives and is connected to the water circulating system. The necessity for climbing up on the outside of the locomotive to apply compound with the attandant hazards of ladders, unsteady footing, etc., is eliminated.

Called the Safti-Spenser it injects the water treating compound steadily and constantly even when the engine is rolling. Another advantage claimed is in the practical elimination of dermatitis and skin irritation from the treating compounds.

Car-miles per "HOT BOX" hit low point in July



EVERY year for the past seven years the "hot box" problem has been growing steadily worse, A.A.R. records show. And these same records show that the worst month of the year is July, with freight cars averaging only 100,000 car-miles between set-outs for "hot boxes".

So we can expect to see the next thirty days set a new record of train delays, interrupted schedules, damage to lading and costly journal repairs, all due to "hot boxes".

By switching to "Roller Freight"—freight cars with Timken® roller bearings instead of old-style friction bearings—railroads can eliminate the main causes of "hot boxes": 1) waste grab 2) loss of lubricant 3) contamination of lubricant by dirt and water. With Timken bearings there *is* no waste. Highly effective seals permit long-lasting grease lubrication. Lubricant stays *in*—dirt and moisture stay *out*.

"Roller Freight" offers you many other big operating economies. It reduces terminal inspection man-hours 90%. Cuts lube bills up to 89%. Cuts starting resistance 88%, which means jolt-free starts and stops, less damage to lading.

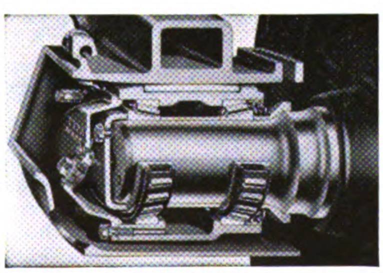
It's estimated that when all railroads go "Roller Freight" they'll save $190 million a year, net a 22% yearly return on the investment! And the cost is low! Complete assemblies of cartridge journal box and Timken bearings for freight cars cost 20% less than applications of six years ago.

For additional information write The Timken Roller Bearing Company, Canton 6, O. Cable address: "TIMROSCO".

TIMKEN

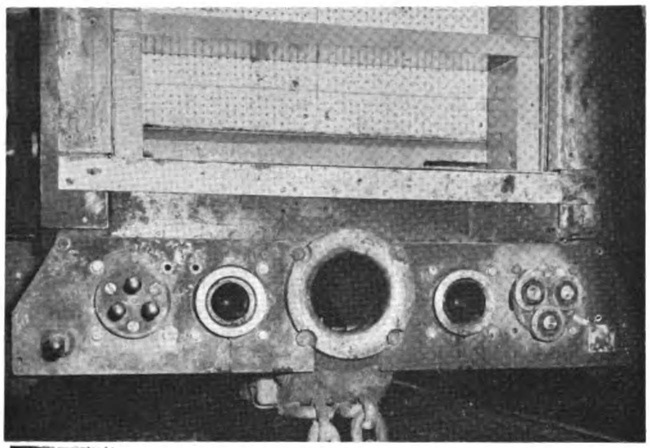
TRADE-MARK REG. U. S. PAT. OFF.

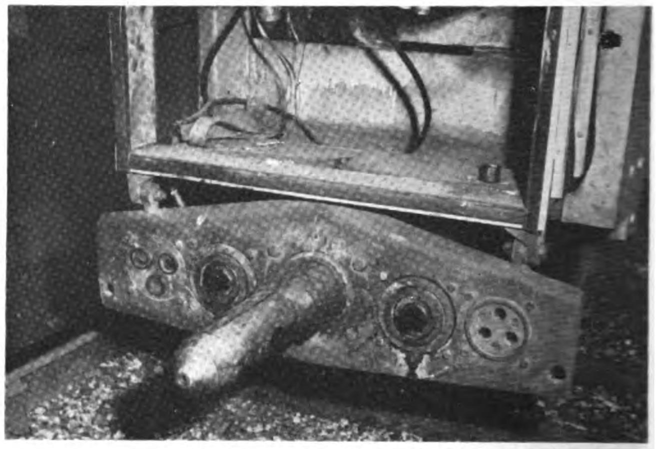
TAPERED ROLLER BEARINGS

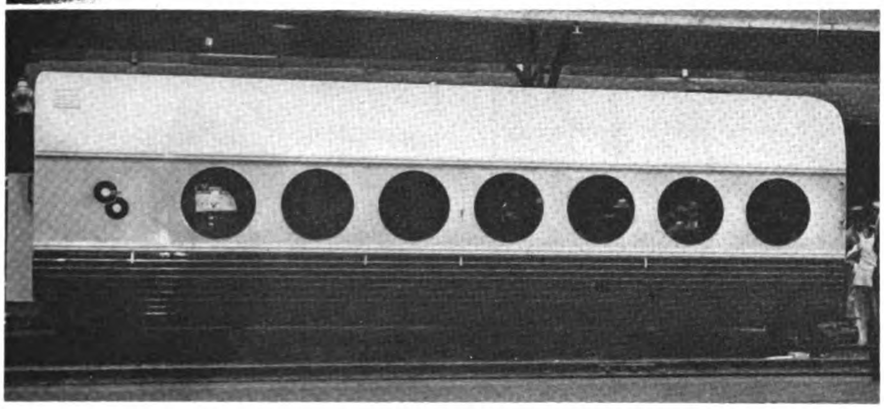


NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

NEWS







Chesapeake & Ohio Unveils "Train X" Car

A SINGLE-AXLE, trailer-type coach, built by the Pullman-Standard Car Manufacturing Company from designs developed by the Chesapeake & Ohio for its experimental "Train X," was displayed to executives of some 15 major United States and Canadian railroads on June 11 in a special run from Detroit to Plymouth, Mich., and return.

The "Train X" car is approximately 31 ft. long, or about one-third the length of a conventional car. The floor is 2½ ft. nearer the rails and the roof is 3 ft. lower. The car is mounted on two rear wheels with a single axle and has a trailer type connection to the car ahead. As shown above it is disconnected from the special adapter car used to couple it to standard locomotives, and the forward end of the car (at right of picture) is supported by dolly wheels.

The experimental car seats 28 passengers. As displayed on June 11, the car is an engineering model and is not finished for regular service. The exposed wiring and various instruments have been installed to determine stresses, ride characteristics, temperature control, etc. The spring suspension design creates a pendulum effect so that the car banks into curves somewhat like a bicyclist, to provide passenger comfort even during high speed operations around curves.

"Train X" cars are designed to couple on impact (two upper pictures). Service lines are connected, valves are opened and couplings are locked by lifting the dolly wheels which carry the front end of a separated car. Lowering the dolly wheels unlocks the coupling, disconnects service lines and closes valves. This method of coupling and uncoupling is said to eliminate manual operations now performed between and under conventional cars. Wheels are rubber centered to lessen noise and permit higher braking ratios, while disk type brakes are installed outside of each wheel for easy access.

Economic studies, the C&O says, indicate that "Train X" in mainline service would save enough to pay for itself in from two to four years. The savings would be derived by reduction of weight to about one-third that of present lightweight equipment, by simplification of mechanical design, and by placing in a single head-end car most of the mechanical equipment now carried under each separate car.

St. Louis Diesel Club Honors H. H. Urbach

H. H. URBACH, general superintendent motive power and machinery, Chicago, Burlington & Quincy, was honored at the May 13 meeting of the St. Louis Railroad Diesel Club by the presentation of its bronze plaque, awarded annually, for outstanding contribution to the development and successful use of diesel motive power in railroad service.

In addressing the meeting following the award, Mr. Urbach recalled the history of the development of diesel service on the Burlington which began with the 600-hp. unit on the "Pioneer Zephyr" which went into service in 1934. This was soon followed by two 3,000-hp. diesels for the "Denver Zephyrs" and two 1,800-hp. diesels for the "Twin Zephyrs." The high availability and trouble-free operation of these locomotives, which averaged up to and over 30,000 miles a month, Mr. Urbach said, proved that diesel power for passenger service was practical and sound. The road now has 103 units for all passenger service, except a few suburban trains for which additional units are to be provided.

Freight diesels, Mr. Urbach said, were first tested on the Burlington in 1937.

Unbeatable for high-voltage use

"U. S." USKORONA-NEOPRENE POWER CABLES offer to the exacting railway industry an unbeatable reliability on overhead and underground high-voltage power applications on circuits up to 8000 volts between phases and at conductor temperatures up to 75° C. They will not crack after 3 hours in air containing .015 per cent ozone. Light in weight, easy to install and join, resistant to oil, heat, sunlight, flame, acids, alkalies and corrosive chemicals. USKORONA-NEOPRENE cables also eliminate electrolysis. In the chart at the right are the guaranteed test values.

PRODUCTS OF U.S. RUBBER SERVING THROUGH SCIENCE

MOISTURE RESISTANCE (Maximum Values)

Dielectric Constant and Power Factor of the insulation after immersion in water at 50° C.: Dielectric Constant, one day is 4.5; per cent gain, 1 to 14 days is 5.0; per cent gain, 7 to 14 days is 2.0; Power Factor, per cent, one day is 3.0; Stability Factor 40-80 volts/mil two weeks, per cent is .5.

PHYSICAL AND AGING PROPERTIES (Minimum Values)

	Uskorona			Neoprene Jacket	
	Unaged	After 96 Hrs. O.B.	After 7 Day Geer Oven	Unaged	After 96 Hrs. O.B.
Tensile Lbs./Sq. In.	500	450	450	1800	1600
Elongation Per Cent	250	200	200	300	250

UNITED STATES RUBBER COMPANY

ELECTRICAL WIRE AND CABLE DEPARTMENT • 1230 AVENUE OF THE AMERICAS, NEW YORK 20, NEW YORK

Fifty-eight locomotives (212 units) have since been acquired and assigned in nine different pools. The road also has forty 1,500-hp. general-purpose diesel units equipped with steam generators and dual and multiple-unit control; 150 single units and 14 double-unit road switchers. About 400 steam locomotives remain on the road.

The maintenance of diesel locomotives on the Burlington, he said, has been largely by cut and try methods in two fairly modern running repair shops and one general repair shop. This state of flux, said Mr. Urbach, "presents many questions which the Burlington attempts to answer by means of a diesel committee composed of the superintendent of automotive equipment as chairman and all diesel supervisors on the system as members." This committee keeps before it the present maintenance policy, investigate all new suggestions presented from the field from time to time, and considers what improvements can be made in present maintenance procedures.

N. Y. RR Club To Hold Fourth Essay Contest

"To encourage constructive thought about railroad problems by students of transportation and younger men in railroad employ" the New York Railroad Club has announced its fourth Roy V. Wright Memorial Essay Contest.

Essays may be on "any subject calculated to make for improved railroading"; should be not less than 3,000 nor more than 7,000 words in length; and must be in the hands of C. T. Stansfield, executive secretary of the club, not later than October 15, 1952. There is a first prize of $500 and 10 other awards of $100 each.

Additional information concerning the contest—which is named for the late editor of *The Railway Mechanical and Electrical Engineer* — may be obtained from Mr. Stansfield at 30 Church street, New York 7.

SUMMARY OF MONTHLY HOT BOX REPORTS

Month	Foreign and system freight car mileage (total)	Cars set off between division terminals account hot boxes			Miles per hot box car set off between division terminals
		System	Foreign	Total	
July, 1950	2,745,932,894	.....	.....	23,957	114,619
August, 1950	2,937,455,020	7,422	15,490	22,912	128,206
September, 1950	2,974,297,739	6,541	12,881	19,422	153,141
October, 1950	3,165,997,915	4,343	8,935	13,278	238,439
November, 1950	2,868,871,913	2,536	5,331	7,867	364,672
December, 1950	2,813,042,212	2,278	5,968	8,246	341,140
January, 1951	2,840,847,511	2,870	8,436	11,306	251,269
February, 1951	2,425,226,454	4,528	14,063	18,591	130,452
March, 1951	3,063,173,942	3,667	10,078	13,745	222,857
April, 1951	2,996,562,763	3,702	8,914	12,616	237,521
May, 1951	3,013,634,782	5,631	13,737	19,368	155,599
June, 1951	2,874,873,495	7,074	15,376	22,450	128,057
July, 1951	2,768,920,095	8,886	18,823	27,709	99,929
August, 1951	3,009,371,111	9,023	19,092	28,115	107,038
September, 1951	2,925,570,545	6,472	13,565	20,037	146,008
October, 1951	3,116,490,095	4,131	9,053	13,184	236,384
November, 1951	2,939,503,144	2,022	4,405	6,427	457,368
December, 1951	2,752,316,133	2,130	5,398	7,528	365,611
January, 1952	2,824,298,630	3,208	7,197	10,405	271,437
February, 1952	2,809,162,671	2,723	6,473	9,196	305,477

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE JUNE ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horse-power*	*Service*	*Builder*
Pittsburgh & West Virginia	6[1]	2,000	Road switch	Fairbanks, Morse
Rutland	4[2]	1,600	Road switch	Alco-G. E.

STEAM LOCOMOTIVE ORDERS

Road	*No. of locos.*	*Type*	*Builder*
Norfolk & Western	15[3]	0-8-0	Company shops

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Atlantic Coast Line	12	Air dump	Baldwin-Lima-Hamilton
Norfolk & Western	1,000[3]	70-ton gondola	Company shops
	500	50-ton gondola	Company shops
	25	70-ton flat	Company shops
	500	Box (B8 class)	Pullman-Standard
Tennessee Copper Co.	6	Air dump	Baldwin-Lima-Hamilton
Western Pacific	100	70-ton ballast	Pullman-Standard

PASSENGER-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
New York, New Haven & Hartford	3[4]	RDC-1	Budd Co.
	3[4]	RDC-3	Budd Co.

[1] Acquisition of these units next February expected to complete dieseliztion of the road. The new units will cost approximately $1,050,000.

[2] All units to be equipped with steam generators.

[3] Construction of the new switchers, which will each have a tractive force of 62,932 lb., will begin in December. Delivery of the Pullman-Standard cars expected next fall.

[4] Estimated cost of the six cars, $960,000. The road is also contemplating the purchase of 11 additional RDC units.

NOTE:

Texas & Pacific.—The board of directors of the T. & P. have authorized the construction of 200 70-ton hopper cars.

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

Freight Service (Data From I.C.C. M-211 and M-240)

Item No.		Month of February 1952	Month of February 1951	2 months ended with February 1952	2 months ended with February 1951
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	19,162	24,562	39,842	53,435
3-06	Total, Diesel-electric	25,252	18,014	50,937	38,937
3-07	Total, electric	771	699	1,573	1,536
3-04	Total, locomotive-miles	45,193	43,281	92,361	93,91
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,640	1,509	3,288	3,259
4-06	Empty, total	880	672	1,778	1,525
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	34,979	40,438	72,266	89,300
6-02	Total in oil-burning steam locomotive trains	8,333	10,399	16,782	22,127
6-03	Total in Diesel-electric locomotive trains	70,542	49,383	139,962	107,057
6-04	Total in electric locomotive trains	2,175	1,900	4,316	4,175
6-06	Total in all trains	116,070	102,147	233,378	222,693
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.04	1.05	1.04	1.05
10-02	Loaded freight car-miles	40.00	39.10	39.30	38.80
10-03	Empty freight car-miles	21.40	17.40	21.20	18.10
10-04	Total freight car-miles (excluding caboose)	61.40	56.50	60.50	56.90
10-05	Gross ton-miles (excluding locomotive and tender)	2,827	2,645	2,786	2,649
10-06	Net ton-miles	1,317	1,252	1,299	1,248
12	Net ton-miles per loaded car-mile (M-211)	33.00	32.00	33.10	32.20
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	65.10	69.20	64.90	68.10
14	Averages per train hour (M-211):				
14-01	Train miles	17.40	16.40	17.20	16.50
14-02	Gross ton-miles (excluding locomotive and tender)	48,609	42,743	47,418	43,134
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	46.60	42.30	45.30	44.00
14-02	All	44.50	40.30	43.20	42.00
15	Average net ton-miles per freight car-day (M-240)	954	894	928	920
17	Per cent of home cars of total freight cars on the line (M-240)	40.90	34.40	40.70	34.50
	Passsenger Service (Data From I.C.C. M-213)				
3	Road motive-power miles (000):				
3-05	Steam	7,459	10,241	16,212	22,825
3-06	Diesel-electric	17,132	14,041	35,297	30,042
3-07	Electric	1,579	1,429	3,298	3,144
3-04	Total	26,171	25,712	54,810	56,011
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	259,643	242,875	542,431	535,625
4-09	Total in coal-burning steam locomotive trains	40,165	53,625	86,908	121,351
4-10	Total in oil-burning steam locomotive trains	24,586	29,450	52,157	67,016
4-11	Total in Diesel-electric locomotive trains	177,296	144,976	366,887	314,186
12	Total car-miles per train-miles	9.72	9.33	9.73	9.47
	Yard Service (Data From I.C.C. M-215)				
1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	936	1,238	1,956	2,682
1-02	Steam, oil-burning	167	218	341	477
1-03	Diesel-electric[1]	3,061	2,563	6,286	5,521
1-06	Total	4,187	4,043	8,631	8,733
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	33	48	71	106
2-02	Steam, oil-burning	11	12	24	27
2-03	Diesel-electric[1]	245	217	510	463
2-06	Total	322	307	671	660
3	Hours per yard locomotive-day:				
3-01	Steam	7.40	8.10	7.40	8.30
3-02	Diesel-electric	17.20	17.30	17.00	17.70
3-05	Serviceable	14.80	14.30	14.70	14.60
3-06	All locomotives (serviceable, unserviceable and stored)	12.80	12.30	12.70	12.60
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.76	1.85	1.81	1.85
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.77	0.78	0.77	0.77

[1] Excludes B and trailing A units.

SUPPLY TRADE NOTES

General Steel Castings Corporation.—*Howard F. Parks, Jr.*, has been appointed manager of sales for the General Steel Castings Corporation, with headquarters at Granite City, Ill., and *Lawrence P. White* has been appointed district manager—sales, at the eastern district sales office at Eddystone, Pa., succeeding Mr. Park.

◆

Independent Pneumatic Tool Company.—The Independent Pneumatic Tool Company has inaugurated a new Thor industrial sales division and has made the following appointments, to effect the new division's expansion of the sales department: *J. A. Hill*, manager of industrial sales; *J. F. Corkery*, manager of electric tool sales, to succeed Mr. Hill; and *G. A. Thoma*, sales promotion manager, to succeed Mr. Corkery.

◆

Westinghouse Electric Corporation.—The Westinghouse Electric Corporation will build a new multimillion dollar plant at Raleigh, N. C., as part of its $296,000,000 expansion program. The plant, more than 500,000 sq. ft. in area and employing 2,500 people, will be for the manufacture of watthour electric meters. Ground will be broken within the next few weeks on a 100-acre site just north of Raleigh. Completion is expected by July 1, 1953.

◆

H. K. Porter Company.—The *Sales Engineering Company*, Salt Lake City, has been appointed exclusive sales representative in the Mountain states area for the *American-Fort Pitt Spring* division of the H. K. Porter Company.

The *John J. Gillis Company*, 20 Provi-

dence street, Boston 16, has been appointed exclusive sales representative in New England for American Fort Pitt.

◆

CONSOLIDATED MACHINE TOOL CORPORATION.—*Lester D. Chirgwin*, vice-president of the Farrel-Birmingham Company, Ansonia, Conn., since 1945, has been elected also president of the Consolidated Machine Tool Corporation, Rochester, N. Y., a subsidiary acquired by Farrel-Birmingham in December 1951. Mr. Chirgwin succeeds *Arthur H. Ingle*, president of Consolidated since 1924. Mr. Ingle will remain on the board of directors of both Consolidated and Farrel-Birmingham and continue as corporation consultant.

Lester D. Chirgwin

◆

AMERICAN LOCOMOTIVE COMPANY. — Nearly 100 representatives from 50 railroads in all parts of the United States and Canada attended a recent two-day symposium in Schenectady, N. Y., as guests of the American Locomotive Company. Subject of the symposium was use of the spectrograph in analyzing diesel engine lubrication oil to detect and prevent serious engine trouble. The chairman was H. R. Sennstrom, Alco research and testing engineer, who gave a description of Alco's own spectographic work over the past several years.

A. C. Mengel, chief engineer of Alco, opened the symposium with a report on the development of spectrographic methods. A technical account of Alco's present laboratory and field methods was given by L. L. Nathan, Alco chemical engineer.

Among railroad representatives favoring continued use of spectographic analysis for diesel engine maintenance control were: V. E. Amspacher, chief chemist, Pennsylvania; F. Thomas, assistant to general superintendent of equipment, New York Central; Wade R. Seniff, engineer of tests, Baltimore & Ohio; W. E. Lasky, engineer of tests, Gulf, Mobile & Ohio; C. C. Mugford, assistant engineer of tests, Southern Pacific; Stanley Crane, engineer of tests, Southern; W. F. Sinclair, engineer of diesel equipment, Canadian Pacific, and Kenneth Cartwright, general mechanical superintendent, New York, New Haven & Hartford.

Mr. Seniff summarized the general conclusions of the symposium by saying that while spectrographic analysis had already

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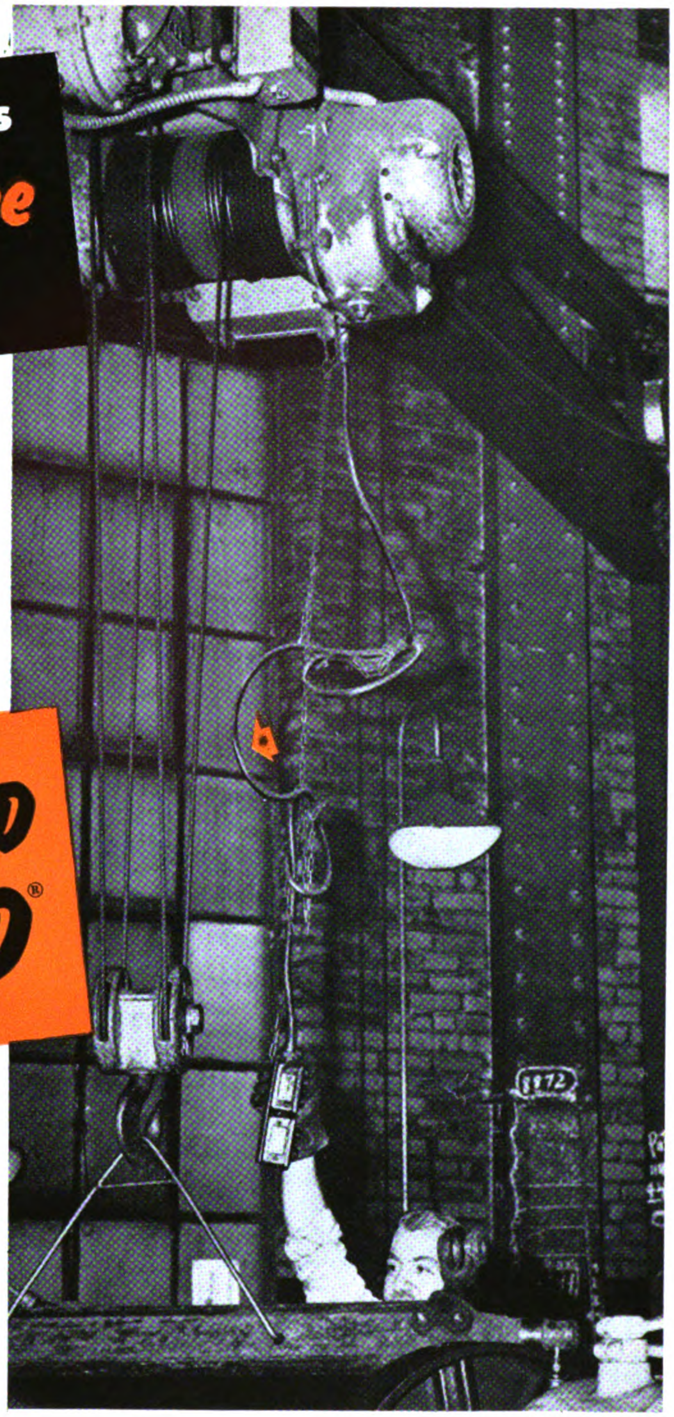

Shop equipment and portable tools stay on the job longer and get more work done when Hazacords help. That's because Hazacord is made to stand up under the rigors of rugged shop work. What's the cause of your cord failures . . . oil, grease or chemical attack . . . or just constant physical abuse? For such problems, **Hazacord is the answer.**

Every foot of Hazacord is *cured under pressure in a continuous metal mold* to provide extra density, lasting toughness and a smooth, wear-resistant surface. No other type of sheath can give you the same protection against chemical attack and mechanical damage.

Examine a length of Hazacord . . . immediately, you'll see the name in raised letters—identifying this *mold-cured* cord. It's your best guarantee of top performance and long cord life. Ask your Hazard representative about Hazacord or write for complete details.

Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

HAZACORD *Mold-Cured* **flexible cords**

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proved itself by progress made during the past year, railroads and manufacturers must capitalize on use of spectrography as a vital tool which brings good dividends if accurately and intelligently used. He proposed, as a resolution, that railroads and manufacturers form a committee, headed by Mr. Amspacher, to determine standard laboratory techniques and tolerances for formal submission to the American Society for Testing Materials, which would then establish spectrographic standards for the railroad and locomotive industries.

◆

MINNEAPOLIS - HONEYWELL REGULATOR COMPANY.—*Charles Sanders*, formerly western sales manager for the transportation division of the Minneapolis-Honeywell Regulator Company, at Chicago, has been appointed sales manager of the division to succeed *Maurice R. Eastin*, who has resigned. *Earle Barker*, associated with the transportation division for the past five years, has been appointed eastern sales manager. Mr. Sanders, with new headquarters in Minneapolis, will direct sales of control equipment for railway cars, diesel locomotives, streetcars, subway cars and buses.

◆

NATIONAL MALLEABLE & STEEL CASTINGS CO.—*Robert D. Sowers* has been appointed sales manager of the industrial division at the Sharon Works of the National Malleable & Steel Castings Co., to replace *Paul E. Tamplin*, deceased. Mr. Sowers, who joined National Malleable in 1936, has been with the railway division at the Cleveland general office for the past year.

◆

VANADIUM CORPORATION OF AMERICA.—*Harry E. Orr*, formerly assistant vice-president and manager of district sales for the

H. E. Orr

Vanadium Corporation of America, has been appointed assistant vice-president and manager of engineering sales, with headquarters at Chicago. *John B. Girdler*,

J. B. Girdler

formerly regional manager at the Pittsburgh office, has been appointed corporation sales manager, with headquarters in New York.

◆

HUNT-SPILLER MANUFACTURING CORPORATION.—*Frank A. Messick*, formerly with the mechanical department of the Louisville & Nashville, has joined the Hunt-Spiller Manufacturing Corporation as its representative in the southeastern states.

◆

GENERAL MOTORS PRODUCTS OF CANADA.—The Diesel Engine Sales division of General Motors Products of Canada has been moved from Oshawa to General Motors Diesel, Ltd., at London, Ont. The transfer is part of the policy of combining Canadian sales and distribution of G. M. diesel products at the London plant.

Under *Norman H. Daniel*, manager of the Diesel Engine Sales division at Oshawa, the entire staff of 15 persons has been

assigned to General Motors Diesel, Ltd. It includes *Russell Gage*, sales manager of the division; *R. William McEachran*, parts and service manager; and a field force including district sales managers at Vancouver, Edmonton, Toronto, Cornwall, Montreal, and Moncton, N. B. Mr. Daniel has been appointed director of sales of the new Engine Sales division, and *William M. Warner*, assistant to president of G. M. D. since its formation in 1949, has been appointed assistant director of sales.

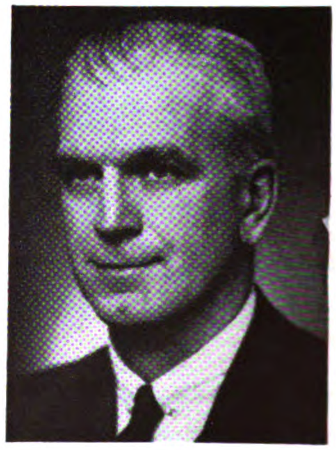
◆

International Nickel Company.—*Ransom Cooper, Jr.*, formerly assistant sales manager of the International Nickel Company, has been appointed manager of the department and *H. D. Tietz*, formerly assistant to the manager of the Inco Nickel alloys department, has been appointed manager of that department. Mr. Cooper and Mr. Tietz will function under Walter C. Kerrigan and L. R. Larson, who, as general sales manager and assistant general sales manager, respectively, are responsible for both primary nickel and mill product sales.

◆

American Car & Foundry Co.—*Thomas C. Ballou* has been appointed district sales manager of American Car & Foundry's New York sales district, in charge of railroad car and miscellaneous sales in New York, New Jersey, New England and Eastern Canada.

Mr. Ballou, who will report directly to F. H. Norton, vice-president in charge of sales, was educated in the Cleveland Heights, Ohio, schools, and is a graduate of Western Reserve University. He was employed by the Canton Tank Car Company of Cleveland before joining the A.C.F. sales staff in that city in 1936. Mr. Ballou later was transferred to the New York sales office, specializing in railroad car and welded products sales. He was appointed sales agent in 1948 and district sales representative in New York in October 1951. During World War II Mr. Ballou was a lieutenant in the U. S. Naval Reserve, much of which service was in the European theatre of operations.



Thomas C. Ballou

◆

Octagon Process Inc.—*Paul Mezick* has been appointed district sales manager of Octagon Process Inc. for the State of Pennsylvania.

Go easy on the Commutator

with

NATIONAL

TRADE-MARK

Carbon Brushes

for Diesel-Electric

Main Generators

There are far more "National" Carbon Brushes on Diesel-Electric locomotive main generators than *all other makes combined!*

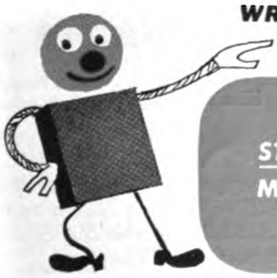
Behind this overwhelming preference for "National" Main Generator brushes is their proved ability to *produce* and *maintain* perfect commutator surface under all *ordinary* operating conditions . . . and to *minimize* commutator wear, bar-burning and copper-dragging under the most *difficult* conditions.

Give costly generator maintenance the brush-off with "National" brushes . . . specifically designed for maximum commutator mileage and efficiency, while combining superior mechanical and electrical properties to assure lasting and dependable brush service.

LOW LIGHT BILLS . . .

. . . mark phenomenal acceptance of "EVEREADY" No. 1050 Industrial Flashlight Batteries by a broad cross-section of industry. Delivering twice the usable light of any battery we've ever made before, it will not swell, stick, or jam in the flashlight . . . has no metal can to leak or corrode.

WRITE FOR BULLETIN CP-2426—"NATIONAL" STANDARDIZED BRUSHES



BUY NATIONAL STANDARDIZED BRUSHES FOR MOST EFFICIENT MOTOR AND GENERATOR OPERATION.

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A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.
District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco
In Canada: National Carbon Limited, Montreal, Toronto, Winnipeg

SAFETY CAR HEATING & LIGHTING CO.—*Harold F. Kneen* has been elected director and vice-president of the Safety Car Heating & Lighting Co., with headquarters at the Hamden, Conn., plant. Mr. Kneen formerly was manufacturing vice-president

Harold F. Kneen

and a director of the Lincoln Electric Company of Cleveland, with whom he had been associated since 1929. He is a graduate of Cornell University (1925) with an engineering degree. He received a master's degree in 1933.

◆

AMERICAN STEEL FOUNDRIES.—*Goff Smith*, sales engineer in the New York office of American Steel Foundries, has been granted a leave of absence to attend the School of Industrial Management of the Massachusetts Institute of Technology, under a fellowship award of the Sloan Foundation program. *John M. Whalen*, associated with the Army Transportation Corps, has joined the sales staff as mechanical assistant.

◆

MAGNAFLUX CORPORATION. — *Hamilton Migel*, second vice-president and eastern manager of the Magnaflux Corporation, has been appointed to the newly created position of second vice-president in charge of engineering at Chicago. *Roy O. Schiebel, Jr.*, midwest manager at Chicago, has been transferred to New York as eastern manager. *Kermit A. Skeie* succeeds Mr. Shiebel as midwest manager at Chicago.

Blackstone Studios

Hamilton Migel

Union Carbide & Carbon Corp.—*Thomas D. Cartledge* has been appointed president of *Linde Air Products Company,* a division of Union Carbide and Carbon Corporation. Mr. Cartledge has been senior vice-president of Linde Air Products Company, and a director and vice-president of Dominion Oxygen Company, Limited, a Union Carbide subsidiary.

Mr. Cartledge was born in Jefferson, Ga., and attended Erskine College in South Carolina. He entered the United States Navy as an enlisted man at the beginning of World War I and rose through the ranks to lieutenant (j.g.). Upon leaving the service, he was employed by Linde as a salesman, assigned to a Cleveland territory. Within a short while, Mr. Cartledge was appointed district manager in Kansas City, and later he was district manager in Dallas. In 1925 he was transferred to Linde's general sales man-

Thomas D. Cartledge

agement staff in New York, and later became manager, gas sales. After holding the position of assistant general sales manager and general sales manager, in 1940 he was elected vice-president. Four years later he became senior vice-president, director and a member of the executive committee of the Linde company.

Kenneth I. Thompson, who has been appointed vice-president-sales of the Oxweld Railroad Service Company, a division of Union Carbide & Carbon, as announced in the June issue, entered the industrial equipment business in 1921 with the Pennsylvania Pump & Compressor Co. and later worked for the Lehigh-Fuller Company. In 1937 he was associated with Ingersoll-Rand and in 1945 he joined Oxweld Railroad Service as eastern sales manager. Mr. Thompson was appointed general manager in 1950, with headquarters in Chicago.

◆

Vapor Car Heating Company.—*W. J. Burrows* has become associated with the Vapor Car Heating Company, Ltd., of Montreal. Mr. Burrows formerly was with the Canadian National in its electrical and diesel engineering department. *L. D. Hassal* has been transferred from Montreal to Calgary, Alta., to be in charge of Vapor Car Heating service for railroads in that area.

◆

Townsend Company.—*Edward C. Sterling, Jr.* has been appointed western division sales manager of the Townsend Company, with headquarters at the Cherry Rivet division offices in Los Angeles, to succeed *Edward H. Stau,* who has resigned.

◆

General Electric Company.—*Frank J. Staroba,* formerly midwestern district manager of the Carboloy department of the General Electric Company, has been appointed field sales manager, with headquarters at Detroit. *L. L. DeCoster,* formerly sales engineer in the Indianapolis and Chicago areas, has been appointed midwestern district manager at Chicago. *L. W. Ballard* has been appointed manager of transportation sales, apparatus sales office, Philadelphia.

L. W. Ballard

Mr. Ballard joined G.E. as a student engineer on the company's test program at Schenectady, N. Y., after graduating in 1935 from the University of Virginia with a B.S. degree in electrical engineering. He was transferred to the quotation division of the company's Philadelphia office in 1937, and in 1939 was named control specialist for the company's Atlantic district. In 1946, he was appointed sales engineer handling steel accounts. For the past five years he has been contacting railroads in the Philadelphia area.

◆

DuKane Corporation.—The Bogue Railway Equipment division of the *Bogue Electric Manufacturing Company,* has been appointed authorized distributor for DuKane Corporation sound products. The Bogue concern will distribute DuKane intercommunication and sound equipment to the railroad industry on a national scale, along with railway products manufactured by Bogue.

◆

Joseph Dixon Company.—*John B. Van Why* has been appointed sales representative in the Connecticut, Rhode Island and western Massachusetts area for the Joseph Dixon Company, Jersey City, N. J. Mr. Van Why will handle Dixon Silica-Graphite paints and Dixon graphite and graphited lubricants.

◆

Farr Company.—The Farr Company, of Los Angeles, has appointed four new representatives, as follows: *Donald Southard* of

Denver, to cover Colorado and Wyoming; the *F. W. Jenike Company*, Cincinnati, for the Cincinnati trading area and Kentucky; the *Charlie Wood Company*, Columbus, Ohio, for the Columbus, Dayton, Mansfield and Coshocton trading areas; and the *William M. Shank Company*, Indianapolis, to cover southern Indiana.

◆

Journal Box Servicing Corporation.—*Joseph M. McNamara* has been appointed general manager of the Journal Box Servicing Corporation at Indianapolis, Ind.

◆

Dearborn Chemical Company.—*Leo E. Flinn* has been appointed sales manager of rust preventives for the Dearborn Chemical Company.

◆

Bowers Battery & Spark Plug Co.—*R. M. Jaccard* has been appointed sales manager, industrial division, Bowers Battery & Spark Plug Co., Reading, Pa. Mr. Jaccard will be in direct charge of sales of all batteries for industrial trucks, diesel and mine locomotives, railroad lighting and similar installations.

◆

Fansteel Metallurgical Corporation.—*Dr. Frank H. Driggs*, executive vice-president of Fansteel Metallurgical Corporation, has been elected president of Fansteel and the subsidiary Weiger Weed & Co. *Glen Ramsey*, general manager of the rectifier-capacitor division of Fansteel, has been elected vice-president.

◆

H. K. Porter Company.—The *Quaker Rubber Corporation* division of H. K. Porter Company, Philadelphia, has established a branch warehouse and sales office at 430 South Mill street, Lockland 15, Cincinnati. The new branch is under the supervision of *W. W. Hutchinson*, who formerly covered the Toledo territory.

Obituary

Anthony G. Dohm, vice-president in charge of sales for the Camel Company of Chicago, died May 31 in his home in Chicago.

John A. MacMillan, director and former president and chairman of the board of the Dayton Rubber Company, Dayton, Ohio, died on June 7.

PERSONAL MENTION

Baltimore & Ohio

O. B. Capps appointed mechanical inspector at Baltimore.

Kenneth K. Kessler appointed engineer of physical tests.

Canadian National

E. J. Cooke, superintendent Transcona, Man., appointed assistant general superintendent car equipment, Central region, with headquarters at Toronto.

W. G. Palmer, assistant general superintendent car equipment, Central region, at Toronto, has retired.

Chesapeake & Ohio

C. D. Allen appointed superintendent motive power, with headquarters in Richmond, Va. Former position of assistant superintendent motive power abolished.

B. J. Rucker appointed assistant superintendent of the car department at Richmond, Va. Former position of chief car inspector abolished.

J. C. Smith, assistant shop superintendent at Huntington, W. Va., appointed general master mechanic at Clifton Forge, Va.

L. H. Booth, master mechanic at Peru, Ind., appointed general master mechanic at Huntington, W. Va.

W. S. C. Burwell, master mechanic at Stevens, Ky., appointed master mechanic at Russell, Ky.

Erie

Charles F. Schwartz, master mechanic at Jersey City, N. J., appointed general

What is the <u>only</u> proven process for rebuilding Diesel cylinder heads?

THIS is an abstract from a report on the subject presented by two experts* before the American Welding Society:

> "There appears to be no record of experience that would justify a departure from the long-established requirement for preheating and annealing, when welded cast iron parts are to be subjected to such severe conditions and changes in temperature as those for a Diesel head."

This is precisely the process used by RALPH STARK, INC. . . . based on over twenty years experience trying *all* processes.

No one is better equipped than STARK to rebuild Diesel heads this way —the only proven way. We have specially designed ovens built for just this purpose. In these scientifically regulated ovens, exclusive with STARK, every head is preheated and annealed, resulting in perfect fusion and elimination of internal strains and stresses.

STARK preheating and annealing ovens are just one example of the many exclusive advantages that STARK rebuilding offers. More than half a million STARK-rebuilt Diesel cylinder heads have given new part performance throughout the country — a record unmatched in the industry.

STARK production methods and equipment are the result of more than 20 years accumulated know-how in precision rebuilding of cylinder heads for long years of hard service. Valve seats are built up with a special Chrome Nickel Alloy, developed exclusively for this purpose and used *only* by STARK. Chrome Nickel Alloy valve seats require far less regrinding, last longer, and result in substantial savings on Diesel maintenance costs.

Built-up valve seats are machined with precision cutters for true accuracy. All machining is done with special tools, cutters, and templates to original specifications. Surfaces are finished by grinding machines designed for the specific job. STARK craftsmen have been intensively trained for the STARK rebuilding process. *No plant in the world* can give you more dependable rebuilding at such low cost.

STARK guarantees equal-to-new efficiency. Send us a trial order of your cracked Diesel cylinder heads for rebuilding. Then examine and test the rebuilt heads. If you are not satisfied, there will be no charge. Or write for further details and information about the STARK rebuilding process and how it can mean large savings in your maintenance costs.

RALPH STARK

INCORPORATED

43-12 THIRTY-THIRD STREET
LONG ISLAND CITY, N.Y.

*La Motte Grover, Welding Engineer, and R. L. Rex, Superintendent of Railroad Service, both of Air Reduction Company.

master mechanic, with headquarters at Jersey City. Territory extended to include Port Jervis, N. Y., and Avoca, Pa.

EARL BRANNING, master mechanic at Hornell, N. Y., appointed general master mechanic, with headquarters at Hornell.

JOHN H. RAY, assistant electrical engineer, appointed electrical engineer at Cleveland.

FRANCIS D. DUNTON, master mechanic at Meadville, Pa., appointed master mechanic at Jersey City, N. J. Position of master mechanic at Meadville abolished.

FRANK REVANA, master mechanic at Cleveland, Ohio, has had territory extended to include Meadville, Pa.

FRANCIS D. KENNEDY, master mechanic at Buffalo, has had territory extended to include Salamanca, N. Y., and Jamestown, and Bradford, Pa., and Brockway.

CARL E. MAAHS, master mechanic at Port Jervis, N. Y., appointed master mechanic at Hornell, N. Y. Position of master mechanic at Port Jervis abolished.

DAVID M. HUGGINS has been appointed assistant master mechanic at Cleveland, Ohio.

GORDON E. MCKINNEY, electrical engineer at Cleveland, appointed chief electrical engineer, with headquarters at Cleveland.

Gordon E. McKinney

CHARLES M. STUBBS appointed assistant master mechanic at Marion, Ohio.

St. Louis—San Francisco

With the removal of Southern division headquarters from Memphis, Tenn., to Amory, Miss., the office of master mechanic was transferred to Amory, but that of the general car foreman remained at Memphis.

C. O. YOWELL appointed roundhouse foreman at Pine Bluff, Ark. Position of assistant roundhouse foreman abolished.

J. H. LEE appointed roundhouse foreman at Pine Bluff, Ark. Position of backshop foreman abolished.

C. E. FISHER appointed roundhouse foreman at Pine Bluff, Ark. Position of assistant roundhouse foreman abolished.

RALPH MILLER appointed road foreman of engines, with headquarters at Illmo, Mo.

R. A. SCOTT, assistant supervisor of diesel equipment, appointed general diesel and steam locomotive foreman. Position of assistant supervisor abolished.

St. Louis Southwestern

M. P. NUNNALLY, assistant superintendent motive power, appointed engineer of motive power at Pine Bluff, Ark.

G. S. GANDY, master mechanic at Pine Bluff, Ark., appointed assistant superintendent of motive power, continuing the duties of his former position which has been abolished.

E. M. HERCHER, night roundhouse foreman at Pine Bluff, Ark., appointed diesel locomotive foreman. Position of night roundhouse foreman abolished.

CLIFTON E. BYNUM, relief foreman at Tyler, Tex., appointed mechanical foreman at Dallas, Tex.

Mechanical Division Annual Meeting—An Appreciation

In a number of respects, the 26th annual meeting of the A. A. R. Mechanical Division at San Francisco, June 24 to 26, inclusive, was a marked success, notably from the points of view of attendance, highly constructive addresses including two by railroad presidents, generally condensed presentation of committee reports, more discussion than usual and participation of younger men in the proceedings. An unexpected and much appreciated feature was a moving picture, presented at the beginning of one of the afternoon sessions, which showed record-breaking snow conditions in the Sierra Nevada and other western mountains last winter and how railroads used equipment and men to overcome these conditions.

One thing which added greatly to the value of the sessions was the fact that all five of the major speakers largely avoided generalities, platitudes and complaints about subsidized competition and, instead, devoted themselves to fairly specific problems which mechanical officers must solve in the interests of improved service.

Registration at the San Francisco meeting showed an attendance of about 381 railroad men, 41 private car company representatives, 36 others, or a total of 456 railroad men. This may be compared (and favorably) with the 358 railway supply men in attendance who thus for the first time in recent years were surprised to find themselves outnumbered at a meeting of this kind. The Southern Pacific alone sent 205 men to the meetings on various days and the average attendance at each of the six sessions has been estimated at 600. A tribute to the interest in the proceedings and the effectiveness of Chairman B. F. Brown as a presiding officer is afforded by the discussions which waxed quite spirited at times and by the small number of men who failed to sit through until conclusion of each of the business sessions.

Special attention may well be centered on the address of F. B. Whitman, president, Western Pacific, as abstracted elsewhere in this issue. He confined his remarks almost exclusively to the need for employee training, development of competent supervisors and the general importance of human relations in mechanical department work. In fact he suggested that the Mechanical Division take specific steps in this direction by appointing a committee to study and report on various phases of the matter.

Similarly, D. J. Russell, president, Southern Pacific, delivered himself of some equally potent remarks about research, such as: "We live in a new era of research. Only those that are ahead by research will be ahead at the finish line."

The vast amount of present railroad research, most of it unseen by the general public, was described by Mr. Russell with the comment that it is not enough. He mentioned the Central Research Laboratory of the A. A. R. at Chicago; the various research projects farmed out to research institutes by the railroads; research continually carried on by the railroad supply industries, and the never ending research on the railroads themselves, which constitute "a laboratory more than 220,000 miles long for the invention and testing of improvements in plant and equipment and in methods and services, tested under actual service conditions."

"I would like every railroader to be proud of what has been accomplished, but at the same time not be satisfied. We must engage in railroad research more vigorously, and with more imagination. There are always better, undiscovered ways of doing any job, and better kinds of equipment with which to do it. We've got to keep improving if we expect to keep up with the parade. Research is the answer."

Discussing subjects of interest to his audience of experts on railroad motive power and cars, Mr. Russell mentioned the possibility of improving the air conditioning of trains, easing the ride of freight cars, perfecting the design of box cars, investigating the possible use of containers, speeding cars through freight yards, eliminating bearing failures, further standardizing of equipment and parts, and learning how to get more horsepower out of low-grade fuels.

Mechanization has made railroading jobs easier, and its long range effect is to attract more business and create more jobs, according to Mr. Russell who said: "Railroad men and women have a better understanding today than ever before that their interests and those of their company are tied together. They know that permanent well being for employees depends on railroads handling a large volume of traffic and making reasonable profits. They know that excessive labor costs will raise freight rates and drive business to competitors, thereby reducing railroad jobs."

Many forward-looking railway men will go along with Mr. Russell's concluding thought that practical mechanical officers especially should encourage, urge and insist on modern research in railroad business, since it is only by intensified research that this country can, first, protect itself and, second, find ways to do things better and easier, and thus release people and resources for a higher standard of living.

West Coast Mechanical Division Meeting Attended by Over 800

The perennial problems of hot boxes, diesel wheels and derailments due to mechanical causes were discussed and several suggestions made for broadening the interest of future meetings

REPRESENTATIVES of 80 railroads from all sections of North America, with an especially large attendance from the Pacific Coast roads, contributed to the success of the Mechanical Division meeting held at the Fairmont Hotel, San Francisco, June 24 to 26 inclusive.

There were 17 technical reports on the program. Less time was devoted to presentation and more time to discussion than has been the custom during past years. Eleven of the 17 reports were discussed.

Addresses were made by the presidents of two Pacific Coast railroads, D. J. Russell, of the Southern Pacific, and F. B. Whitman, of the Western Pacific. There were three other speakers: W. J. Patterson, member of the Interstate Commerce Commission; E. H. Davidson, director of the Bureau of Locomotive Inspection, I.C.C., and L. L. Adams, manager, transportation planning, United States Steel Company. All dealt specifically with matters with which the members of the Mechanical Division are concerned. Mr. Adams told how freight cars look to a steel shipper and made specific suggestions for better meeting the needs of the steel industry.

Mr. Russell, in his address at the opening session, challenged the railroads to do more than what research and the urge to develop better equipment and better ways of doing things already have accomplished on American railroads. "There are always better undiscovered ways of doing any job," he said, "and better kinds of equipment with which to do it. We must engage more vigorously and with more imagination in railroad research—in laboratories or on the job—striving to find better and more efficient ways of serving the public."

The following pages include other addresses and committee reports which are of general interest. The officers elected for 1952-1953 appear on page 59.

General Committee of the Mechanical Division in its meeting room at the Fairmont Hotel, San Francisco on Monday, June 23. Left to right: J. A. Gower, assistant mechanical engineer, Pennsylvania; L. B. George, assistant chief of motive power and rolling stock, Canadian Pacific, alternate for W. A. Newman, chief of motive power and rolling stock; F. K. Stremmel, assistant secretary; J. L. Carver, mechanical and research engineer, Illinois Central, alternate for A. G. Kann, general superintendent equipment; Fred Peronto, secretary; W. M. Keller, director of mechanical research; V. R Hawthorne, executive vice-chairman; B. M. Brown, general superintendent motive power, Southern Pacific, chairman; H. T. Cover, assistant vice-president and chief of motive power, Pennsylvania, vice-chairman; D. S. Newhart, general superintendent motive power, Union Pacific; J. P. Morris, general manager, mechanical department, Atchinson, Topeka & Santa Fe; F. K. Mitchell, manager equipment, New York Central system; M. R. Brockman, assistant vice-president, Southern; F. H. Einwaechter, chief engineer, motive power and equipment, Baltimore & Ohio, alternate for A. K. Galloway, general superintendent motive power and equipment; and C. E. Pond, assistant to superintendent motive power, Norfolk & Western, alternate for R. G. Henley, who is general superintendent motive power.

Address by Chairman Brown

Chairman B. M. Brown welcomed the A. A. R. Mechanical Division to San Francisco and expressed the opinion that it is a good idea to hold annual meetings occasionally in different parts of the country to stimulate the interest and attendance of many railway men who do not normally get to the meetings. He reviewed the scope and purpose of the Mechanical Division and said:

"We must pay tribute to the work of our standing committees who handle a great amount of detail in addition to their regular work on their own railroad and whose decisions have a pronounced influence on railroad equipment, design, and movement.

"The deliberation of each committee is submitted at the annual meeting in pamphlet form for consideration of the members in attendance and provides the opportunity for those who may not be members of the committee to express themselves.

"Important functions of the Mechanical Division include the Inspection and Research departments. Most of you have come in contact with the field inspectors of the Division who are continually following-up on the ground with railroads and private car owners the observance of the rules covering inspection, maintenance and interchange of equipment.

"Research is of great importance in the improvement of equipment design and performance, and the division is well represented in this field. A centralized laboratory has been established and our efforts in this direction are placed in the hands of a Director of Mechanical Research. The research efforts of the Mechanical Division are coordinated with those of other divisions of the Association through a coordinating committee on physical research, so that the expenditures for research in all lines of railroad endeavors undertaken by the Association will be properly evaluated. Services of independent research organizations are engaged on occasion.

"We must also give credit to the influence of manufacturers of equipment and parts for their contribution to the progress of equipment improvements. These suppliers generally have their own research and engineering organization and are continually striving for perfection. Their personnel is, in many cases, recruited from the ranks of experienced railroad men.

"The discussion of reports is a vital function of the annual meetings. It should be borne in mind that the number of members of any of the committees is somewhat limited and the subject broad. The committees to the best of their ability digest the matters referred to them and make recommendations, or otherwise present their deliberations in these reports. Unless they have a frank discussion at the annual meeting they must naturally assume that their conclusions are acceptable. Comments from those in attendance, whether favorable or otherwise, are valuable to the committee in their further deliberation, as they can be reviewed at subsequent committee meetings.

"In paying tribute to the work of our committees, we cannot say that railroad equipment has reached the state of perfection. We know that competition is getting keener, schedules tighter and equipment failures more costly in claims or loss of business so, as your chairman, I place with you the charge that we must continue our efforts to keep equipment abreast of these more demanding requirements. As mechanical department men that is our primary responsibility."

Election of Officers—
Term Expiring June 1954

H. T. Cover, (chairman), assistant vice-president and chief of motive power, Pennsylvania.

D. S. Neuhart, vice-chairman, general superintendent of motive power and machinery, Union Pacific.

B. M. Brown, general superintendent of motive power, Southern Pacific.

M. R. Brockman, assistant vice-president, Southern.

A. K. Galloway, general superintendent motive power and equipment, Baltimore & Ohio.

R. G. Henley, general superintendent motive power, Norfolk & Western.

J. P. Morris, general manager, mechanical department, Atchison, Topeka & Santa Fe.

J. F. Ryan, superintendent machinery, Louisville & Nashville.

J. L. Robson, general superintendent motive power, Great Northern, succeeding F. R. Hosack, general superintendent car department, Chicago, Rock Island & Pacific, resigned. Term to expire June 1953.

Research and the Railroads

Mr. Russell, in his address at the opening session, challenged the railroads to do more than what research and the urge to develop better equipment and better ways of doing things already have accomplished on American railroads. But "there are always better undiscovered ways of doing any job," he said, "and better kinds of equipment with which to do it. We must engage more vigorously and with more imagination in railroad research—in laboratories or on the job—striving to find better and more efficient ways of serving the public."

As examples of the need for constant striving for improvement he cited air conditioning, which has been a great boon to the traveler, but needs more research to improve its reliability and to simplify it so that difficulties may be overcome more readily when they occur.

Inspection of freight trains on the Southern Pacific by walking from end to end is being replaced by inspecting rolling trains in yards, using pits, towers, lights, mirrors and other aids. This has made inspection faster and it is done better. Better shock absorption is needed in freight cars. He asserted that, along with specialized cars, more and more of which are being built, there is need from the railroad standpoint, for a car suitable for wider use. Based on an estimate that about one-fifth of the freight moved by railroad can be moved in containers, he advocates that a great deal more research be devoted to that subject. Containers might make box-car protection unncessary.

Mr. Russell also called attention to the fact that freight cars spend about four times as many hours in yards and terminals as in actual service, which means that "if we could reduce the loss of time by 25 per cent, we gain 100 per cent in useful time." "We point with pride to our increase in ton-miles per freight-train hour, calling it our index of operating efficiency," he said, "but we cannot point with pride to our record of car-hours motionless."

Another serious problem to which Mr. Russell referred is the perennial hot box. "Somewhere is the know-

how that will eliminate it," he said. "We wonder if the present conventional journal box assembly and method of lubrication can be continued in use and in practice indefinitely." Research will "find the answer."

Another object of research is standardization of equipment parts, which increases availability and reduces inventories of parts required for maintenance. But, the speaker remarked, "When researchers come up with something better than our standard, we must adopt that new thing as quickly as can practically be done—taking the long view rather than the short one."

As an example of the new problems with which the railroads will continually be faced, Mr. Russell cited present diesel fuel and lubrication difficulties. "Eventually," he said, "I am afraid, the grade of distillate fuel available for railroads will be lowered. And in diesel locomotives the lowering of fuel quality will increase lubrication problems. We must develop efficient engines using lower grades of fuels. The gas turbine may be a development in that direction."

Mr. Russell advocated the use by individual railroads of outside technical research facilities. He told of the experience of the Southern Pacific in a study of the efficiency of fuel consumption on steam locomotives conducted in the railroad's own laboratory with the help of Battelle Memorial Institute. This resulted in saving many times the cost of the investigation, even though not enough to forestall the diesel invasion. The Stanford Research Institute, connected with Stanford University, has also served the Southern Pacific. These organizations, he said, are available to anyone, and he stressed his belief that railroads should not hesitate to use them.

Among the developments which have taken place on the Southern Pacific, of which it is proud, Mr. Russell mentioned the electric baggage elevators on passenger cars to eliminate crowding of vestibules in loading and unloading, derailment safety guides to keep derailed trucks in line, boiler drop plugs to prevent steam-locomotive boiler explosions from low water, gyro-jet oil burners for steam locomotives, and steps to prevent weevil infestation in box cars. He closed with reference to the new Coordinating Committee on Physical Research of the A.A.R. under the direction of Vice-president Aydelott with its membership of three from engineering, three from mechanical, two from test departments and laboratories, and one an expert on containers and freight loading, whose recommendations to Mr. Aydelott will guide policy.

Address by F. B. Whitman

F. B. Whitman, president, Western Pacific, made the opening address on Thursday morning on the general subject: "Importance of Human Relations in the Mechanical Department". He praised the Division for its contribution in improving material standards, but said this is only part of the job which confronts mechanical department officers if they expect to get the maximum results desired by railroad managements.

Elaborating on this point, Mr. Whitman pointed out that engineers, both in industry and railway service, are generally more interested in materials than in people, but that no matter how skilled they become in utilizing material resources efficiently, this effort is largely ineffective without due attention to the human element. He said that railway employees and supervisors are the greatest asset of any railroad, and this is borne out by the fact that wages are the largest item of expense. For low-cost operation, some means must be found to get better results with present forces, or the same work with fewer men.

Mr. Whitman referred to an experiment some years ago in which a group of employees engaged in winding small motors was subjected to improvements in working conditions and particularly in recognition of their ideas and accomplishment, with highly satisfactory results in increased production. He maintained that effective, trained supervision is a most important requirements and mechanical departments are better situated than most to improve employee relations because sizeable groups of people work under relatively close supervision.

Mr. Whitman recommended more general use of employee and supervisor training courses, more frequent staff meetings of supervisors as well as higher officers and a special effort to recognize individual ability and encourage teamwork. He said that competent supervisors will not only study personnel problems, but present their need for new tools and equipment so factually that management can intelligently evaluate the needs and take appropriate action.

In closing, Mr. Whitman urged the Mechanical Division to give some attention to employee training and relationships and appoint committees as required to develop constructive information and suggestions regarding this important subject.

Address by E. H. Davidson

The trend toward diesel power seems definitely established and sufficient experience has been had to indicate the location and causes of accidents which result in casualties. While the pattern is not inflexibly established the mechanical officer will recognize locations and factors involving greater hazards. The modern diesel-electric unit requires a very high standard of housekeeping if accidents are to be avoided and a high efficiency of operation is to be maintained. A properly groomed unit is far easier to inspect and maintain and is less likely to be responsible for injuries to personnel. When difficulty, particularly with electrical gear or circuits, is experienced on a fouled unit, location of the cause of the trouble is often delayed because of condition of the equipment, repairs require greater time to complete and terminal time is increased.

A number of injuries resulting from falls caused by oil or grease accumulations on decks and passageways have been reported. Frequently the fouled walkway results from oil leaks at the diesel engines or pipe connections, resulting from inadequate maintenance. When these conditions exist there is little that crew members can do to correct them while en route. Another type of accident that has been too frequent is hand injuries caused by slamming doors. Several of these accidents have resulted in severed fingers and were caused by unbalanced air pressures between cabs and engine compartments. Absence of door checks or stops was a contributing cause in the accidents. While the majority of accidents from the above causes were relatively minor from consideration of time lost by the employees, injuries of a maiming nature occurred and future ability of the injured man was correspondingly impaired.

Failure of wheels under diesel-electric locomotive units is a matter of very grave concern. An increasing number of reports of failed wheels are being received and it is apparent that intensity of diesel wheel inspections should be increased. Our district inspectors have been instructed to be particularly vigilant in policing diesel wheel inspections and to emphasize the necessity of cleanliness. A crack in the plate of a dirt incrusted wheel could continue and extend without detection until failure occurred. I urge that emphasis be placed upon provision of proper

facilities for wheel cleaning and inspection; that pit inspection and whitening of wheels be used; that blasting of new wheels and wheels removed for turning be considered and that brake equipment be properly maintained and used to prevent overheating of wheels.

Another matter for serious consideration is inspections and the remedy of defective conditions. In our investigation of reportable accidents the instances where identical defects had been previously reported, either by engine crews or shop inspectors, a number of times preceding the accident, occurs too frequently. Where defects have been repeatedly reported and signed for as repaired, and subsequently an accident with attendant casualties occurs, it may logically be inferred that the defective condition had not been properly corrected. The terminals where these inspection reports are maintained are the places to initiate a follow-up program. Central and division mechanical offices do not generally have such reports available for continuous review and are therefore forced to delegate review of reports to motive power inspectors or other traveling representatives. Recurring defects shown on inspection and work reports may well be viewed as evidence of inadequate or insufficient repairs and as such call for corrective supervisory action. It is not to be expected that the upper supervisory mechanical officers will have either time or opportunity to follow the matter in detail. However, when these officers establish a policy that defects reported shall be promptly and adequately repaired and, through their assistants, impress on all concerned the fact that proper, effective and adequate repairs will pay off in accident reduction, lower maintenance expense and service reliability, a definite advance in safety may be anticipated.

Mechanical Problems

By W. J. Patterson

What is there ahead of us? New problems are constantly arising and old ones re-appearing the solution of which is not always easy. Some of the matters which require immediate attention appear to be hot boxes, diesel wheel failures, air brake inspection and maintenance, dynamic braking, and the presence of toxic gases and fumes in locomotive cabs and control compartments.

The introduction of diesel electric motive power and the rapid conversion to the use of such power calls for intensive research and development toward improved design, inspection and maintenance. The potential danger from failure of draft or running gear of locomotives or cars in longer and heavier trains operating at higher speeds, as well as making longer non-stop runs, is present and stresses the necessity for improved design and maintenance of cars and locomotives.

Engine crews in control compartments of leading units of multiple unit locomotives cannot readily detect early indications of overheated bearings, wheel failures, or other running gear defects. The record of one of the major railroads covering hot bearings detected by hot box alarms during a recent 12-month period showed that 64 were detected, 9 of which were on diesel-electric locomotives. Of these nine, five were detected by employees other than those in the control compartments of the locomotives. In one, members of the train crew detected the odor after an alarm and the train was stopped and inspected twice in a distance of about 40 miles, but the hot bearing was not found. Then after moving another 90 miles it was found that a journal on the locomotive had been burned off. This is a clear indication of the need for a more reliable form of hot box alarm.

At present many driving wheels under diesel-electric locomotives must be replaced because of failure or indication of failure long before the expiration of their normal life. We also know that many runs are being greatly increased in length, as well as in speed, with little or no inspection at so-called intermediate inspection points.

The failure of driving wheels under diesel-electric locomotives is a serious matter. I understand that as a result of a study of a special joint committee some changes have been made in the design of wheels. However, reports of defects found in new, unmounted wheels, and continued reports of failure, indicate the need for further research and development. Each railroad should give consideration to their practices relative to the inspection and testing of these wheels.

The development and use of current specifications for air brakes for freight cars has produced a brake which provides a much needed and long overdue means for improved freight train handling to meet modern operating conditions. Although the AB brake conforms to specifications which were made standard practice in 1933, some railroads have not yet fully equipped even all of their present interchange freight cars. The current air brake maintenance of freight cars is far from good, and getting worse, as indicated by inspections in train yards and on repair tracks.

You have heard a lot of reports in the past several years of serious difficulties with air brake equipment occurring during severe winter weather. Much was said about inferior material, but the fact of the matter is that most of the trouble was due to improper testing, or no testing, which resulted in a lack of proper maintenance.

There has been a marked increase in the use of dynamic braking during the past few years. You are reminded that dynamic braking must be considered as supplemental to and not as a substitute for the use of air brakes on individual cars, which is required by law. Dynamic braking already has led to a tendency to neglect air brake testing and maintenance.

Toxic Gases in Cabs

We have had reports of enginemen suffering from the effects of toxic gases and fumes in control compartments. Continued exposure even to small amounts of carbon monoxide gas can seriously impair the faculties of men, and even prove fatal. Many attempts have been made to determine the maximum allowable concentration of carbon monoxide in air without danger of ill effects. One of the most hazardous effects of carbon monoxide, insofar as train operation is concerned, is one of the first symptoms, which may well prevent the taking of any corrective action or the stopping of the train. That symptom is drowsiness. The Bureau of Safety investigated four serious train collisions during the past two or three years which resulted in 27 deaths and 190 injuries, in each of which there apparently had been no action taken by the engine crew of one of the trains to shut off power, apply brakes, or acknowledge signals just before the accident occurred. Unfortunately, because of the damage to equipment and the fact that, with one exception, all the occupants of the control compartments were killed, it could not be definitely determined just what the conditions were in the compartments at the time the accidents occurred. In the investigation of another rear-end collision in automatic block signal territory which resulted in one death and four injuries, the engineman of the following train stated that he apparently lost consciousness before the accident, as he could not remember anything from the time he left the last station, approximately nine miles from the point of the accident. The flagman of the train that was struck said that even though he had placed torpedoes on the rails, continued to give stop signals with a lighted fusee, and finally threw the fusee at the windshield of the locomotive as it passed, there was no acknowledgement of any signals, power was not shut off, and the brakes were not applied. The fireman, the only other occupant of the control compartment, was killed. In each of these accidents the locomotive was a diesel-electric. Prompt and serious consideration should be given to this matter.

I understand that a committee has been appointed to consider the question of carbon monoxide in control compartments. I suggest that the condition of air in control compartments of all types of locomotives be considered and that each railroad consider the matter in the light of their own operating conditions, particularly with respect to the heating and ventilation of the control compartments, their warnings and instructions relative to the dangers, signs, and symptoms of toxic gas poisoning.

Many of the mechanical supervisors of today are specialized technicians, with little or no previous railway operating experience, whereas in the past much of the actual operating supervision, particularly insofar as the head-end crews are concerned, was by mechanical supervisors who had years of operating experience. We are now finding some practices which appear to indicate that mechanical supervisors, perhaps in their desire to obtain maximum performance and insure protection against breakdowns, may be overlooking the necessity for full compliance with operating rules.

Findings as a result of the investigation of two recent derailments of freight trains which were caused by excessive speed because of trains being out of control on heavy grades are examples of this tendency to cut corners. In the one case a so-called air brake test was made after making up a short train, but a closed angle cock at the rear of the locomotive was not detected. In the other, the initial terminal air brake test was omitted and various operating rules of the carrier covering the operation of trains on grades were not observed. Had the operating rules been complied with, the accidents would not have occurred.

We are finding enginemen, as well as trainmen, who are of the opinion that the air brake system of a train is fully charged as soon as the brake pipe gage on the locomotive or caboose registers the standard pressure. With modern feed valves and large capacity main reservoirs, brake pipe pressure, particularly on short trains, can be built up in a short time, although reservoirs of AB equipped cars require considerably more time. This incorrect understanding had led to improper handling and results in an unsafe condition.

It is difficult for me to convince some of the member lines that when this division adopts a rule it applies to all the railroads alike and should be observed accordingly. Let me give you a typical example of what I mean. The last full year of air brake inspections by our men of trains departing from yards shows that 4,762 cars with air brake defects were either repaired in or removed from trains after such trains had been prepared and inspected by the railroads for departure. These figures are about 50 per cent above similar figures for the fifth previous year. The situation is not much different with respect to other classes of defects. Such a situation indicates that too many defective cars are leaving points where repairs should have been made.

Shipper's Views on Freight-Car Design

By L. L. Adams

The production and delivery of steel requires transportation in large quantities and continually. It is estimated that the production and delivery of one ton of finished steel requires the movement of 7 tons of material made up of 3½ tons of raw materials and 2½ tons of intermediate movements, plus one ton for the delivery of the steel itself. It is clear, therefore, why we in the steel industry are interested in loading rules and in railway freight cars. We have another important reason for our interest. Steel is the largest single commodity used in manufacturing railway cars.

Loading Costs High

I should like to make a few general observations about loading rules. You will notice that I did not include reduction in cost of loading among the advantages that we steel shippers have gained from our joint effort to improve the loading rules picture. While the comparative costs may have lessened if we consider dollar purchasing power between an earlier period and today, actual costs of loading our commodities have increased alarmingly. Furthermore, highway transport availability and utility have improved rapidly. In many instances our commodities can be loaded on rail cars. Most open-top trucks are equipped with devices for fixing loads of steel on the truck. Little dunnage is required and almost no labor on the part of the shipper. Highway vehicles are not subjected to the strains and impacts of rail movement. Riding on rubber, with improved spring suspension and with the load made an integral part of the vehicle by the tie-down devices, the shipment does not need the expensive blocking required for rail movement.

In many cases materials that require wrapping, shrouding, or other costly protection when moved by open-top rail car can be fully protected by a tarpaulin provided by the highway carrier. This means that frequently the final price of the steel to the customer is less if it is shipped by truck than if shipped by rail.

We are in a highly competitive business. There is intense competition between producers of steel and between them and the producers of commodities competitive with steel. Direct costs, such as those of wrapping and shrouding, or indirect costs, including labor and materials expended in affixing shipments to rail cars, cannot fail to affect the decision of steel producers and steel purchasers in determining whether a particular shipment shall move by rail or by truck.

Freight cars are the basic implement of railroad operation. Eighty-five per cent of railroad revenues are produced from goods carried in them. They carry the bulk of the country's commerce. They move ingredients for steel making and deliver most of the finished products. For a considerable portion of the last ten years there have not been enough of them, particularly of certain types. A number have grown old in the service and need to be replaced with larger and better models capable of being operated with less shop time.

On April 15 of this year the Defense Transport Administration stated that the condition of partial mobilization, which has been our situation for several years and may well continue to be for some time to come, required the building of 436,000 freight cars by July 1, 1954. D.T.A. was silent on the types of cars that should be built. The railroads are in a position to find out what kind of cars are needed for their business. In fact, one of the railroads' biggest customers, the steel industry, through the Traffic Committee of the American Iron and Steel Institute has advised railroads periodically of its views on the types of which new cars should consist.

Car Types Needed

United States Steel has been urging that more gondolas be constructed, especially in the industrially expanding west and south. We suggest that at least 10 per cent of the gondolas built be 65 ft. 6 in. in length. The loading of long material on short cars, with idlers or with bearing on two cars, is wasteful of car supply and very expensive to the shipper. Half of the gondolas built should have floors to which dunnage can be nailed. In the past this has meant wooden floors. Today, that is not necessarily true. The nailable steel floor developed by an American steel company has passed the experimental stage. Another steel company, and some railroads, are experimenting, with apparent success, with composite steel and wood floors. The objective is to combine the strength and durability of steel with the opportunity for reduced loading costs when bracing can be nailed to the floor. Building into cars better provision for bracing, or fixing loads with bands, will decrease the damage that results when holes must be cut or burned through car floors and sides in order to properly fix loads on cars.

We urge the construction of more 70-ton hopper cars to make it possible for us to reduce the number of cars handled in our mills and mines. Cars of greater capacity offer an opportunity for reducing transportation costs through the reduction of dead weight per ton of commodity carried and in billing, clerical and administrative costs. Also, less yard capacity is needed when cars have greater carrying capacity.

A relatively new problem in the hopper-car field is the effect of using car shakers. Apparently the car shaker is here to stay, because it is the best answer yet devised for hastening the unloading of many commodities under adverse conditions. Accordingly, we think that railroads must expect their hopper cars to be subjected to shakers and should design them to withstand the effects of these devices.

We have called attention to the need for an industrial box car. By this we mean a car with doors at least 8 ft. wide, with a steel plate across the floor at the door opening and a thick, strongly supported floor. Such a car offers opportunity to reduce loading and unloading costs through the use of modern industrial trucks with high carrying capacity. It also enables one to carry commodities of concentrated weight, such as tin plate, steel sheets and nails, without having them go through the floor en route.

Story of the 65-ft. Gondola

There are advantages to be gained by modification of car types, or by new types, but it is usually a difficult task to convince railroads that new or unusual types should be built. Two cars of fairly recent origin that have proved their value are the 65-ft. 6-in. gondola and the covered hopper. The only problem with either one today is that they are rarely in sufficient supply. Both cars were developed by industry with little or no support from the railroads. Perhaps I can best illustrate my point by briefly reciting the history of the 65-ft. gondola.

About 1925 the Carnegie Steel Company built new structural mills at the Homestead Steel Works. The old mills were kept in operation while the new mills were being built very close by. Much congestion ensued and some operations, including sawing beams into lengths, were moved to a point several miles away. To move these unsawed beams in double loads would have cost many thousands of dollars in labor and material. To avoid this the 65-ft. gondola was devised and twelve of them were authorized and purchased as a part of the construction project. These cars were so successful for short distances that the Traffic Department got the idea of using them on longer hauls and endeavored to interest the railroads in providing such equipment. Every railroad approached replied with a very polite but firm no.

After about a year of effort with no results a new campaign of actual demonstrations of the value of the cars in long hauls was started, using the 12 cars purchased by the Homestead Steel Works. Beginning with relatively short hauls and gradually extending the experiment culminated in a successful transcontinental shipment. During all this period the railroads displayed only a polite interest in the experiment and were not receptive to the idea of acquiring such cars.

In a final effort, one of these cars was loaded and shipped to Atlantic City for exhibition at a railroad meeting similar to this one. One railroad executive was so impressed by the car that he got approval of his board of directors for the purchase of 300 units. Thereafter, other railroads saw the advantages to be gained and, today, there are approximately 8,000 of these cars in service. They have provided not only a more efficient and economical facility for the shippers, but they have paid their way on the railroads in greater safety, fewer empty car-miles and higher load factor per car in the movement of long commodities. However, even today the supply of these cars is not sufficient to meet shippers' requirements after over 25 years of demonstrated usefulness.

Covered Gondola

Other problems are waiting to be solved. Much steel requiring protection from the weather is loaded on open-top cars or trucks because both shippers and receivers find it advantageous and less costly to load and unload with overhead cranes. This material must be wrapped and shrouded with paper when loaded on open-top rail cars. However, it can usually be shipped by truck with no other protection than paper wrapping and the tarpaulin furnished by the trucker. An interesting answer could be a covered gondola. Different types of sliding, telescoping and removable hatch covers are in use on river barges and lake vessels. Several different kinds of removable covers have been used on railroad cars from time to time. Perhaps from these devices ideas can be developed that will make possible suitable covered gondolas. An answer to this problem would help the railroads competitively.

What about wide loads? If gondolas of moderate length could have greater inside width, they would simplify the loading of many shipments that today present problems. Thousands of flatcar loads which we have made at great expense and with much difficulty would have been simple and relatively inexpensive had 120-in. wide gondolas been available. Such a car would not be a specialty car as it could be used in any service to which a gondola is usually put.

High Capacity Hoppers

The steel industry believes in, and practices, heavy loading of freight cars. We think that one of the best competitive opportunities that the railroads have is in the heavy, volume-freight field. We have been very happy to see the trend towards 70-ton cars instead of 50-ton capacity. It may now be the time to take the next step, at least with respect to hopper cars. Ninety-ton four-wheel trucks seem to be the practical answer to the objection that six-wheel trucks are too complicated and troublesome for freight service. One railroad that has a heavy trade both in iron ore and coal has quite a fleet of 90-ton hoppers and is building more. At least one other railroad has 90-ton hoppers now on order, and we confidently expect other orders will be placed. Cars of this capacity are subject to a limit of 251,000 lb. on the rails. To the plea that there are still some railroad structures that will not take this load, I suggest that a considerable number of such cars can easily be kept busy on heavy-duty railroad in volume business. I can see no reason for withholding the obvious advantages that exist in so many instances merely because the car could not be used universally. Furthermore, structures and ways are being improved constantly, so that the areas in which heavy cars cannot be used are being reduced regularly. In building cars to carry more freight per unit, saving of light weight in the car itself is important. High-strength, low-alloy steels have proved valuable in reducing light weight and in providing greater strength.

Freight Cars to Meet 1952's High-Speed Requirements

The use of diesel locomotives, with assists from electric and modern steam power, has resulted in greatly improved increased freight-train speeds and greater tonnage on trains. Where freight moved at 30 or 40 m.p.h. some years ago, 60 is a normal speed today. However, most of our freight cars were built for the slower speeds. Trucks, draft-gear and spring suspension were designed basically for much slower freight-train speeds and for lower switching impacts than those of today. Vertical oscillation, lateral sway and slack action under new train speeds and high-speed switching impacts give the freight and the cars a beating. We need the faster movement. Shouldn't we build resistance to its effects into our cars?

The GAEX car provides an interesting attempt to do this through the use of a different truck design and means of cushioning end-to-end shock. Improved trucks and other devices to protect against some of the effects of greater speed and greater shock have been available for some time, but have not been widely used. Many of the new cars coming out do not seem to be built for today's faster speeds, at least not as far as protection to lading is concerned. If available devices are not all that is needed, I am sure that you in this organization can find the answers. The cost of freight loss and damage demands action. I would point out to you that we shippers have a direct interest in this cost—we pay for it in the end. Many factors other than riding qualities and increased cushioning of slack action built into railway cars will reduce materially damage to freight.

One more thing I should like to mention here. We hope that every possible effort will be made to hold the bad-order percentage to an absolute minimum. Two years ago the high percentage that had been allowed to develop was a deterrent to the effort all of us were making to reach peak industrial production. It also resulted in additional business going to the competitors of the railroads because the rails did not have enough cars in good condition to handle all the freight that was available to them.

Along this line I have been much interested in the decision of some of the coal railroads to build greater strength and longer life into hopper cars by using high-strength steels in the thicknesses normally used when such cars are built of carbon steel. In fact, in some cases greater than normal thicknesses are being used. It is believed that these cars will go double the normal time before classified repairs are necessary.

Whether the objective is to make possible the greatest practicable payload capacity in the cars, to make your allotted tonnage of steel produce more cars, or to build more strength and longer shop-free time into them, these high-strength, low-alloy steels present many challenging opportunities. United States Steel's Railroad Research Bureau stands ready to assist you in working out designs that will utilize them to the best advantage.

In any case, it appears to many of us that it is possible to build freight cars that are better suited to the requirements and conditions of the 1950's instead of cars fundamentally the same as those built 30 years ago. It is good to see that railroads are tackling some of these problems. We are certain that improvement will be the result.

Car Construction

Continuing a practice started in 1936 the Car Construction Committee presented statements of the freight cars ordered during the year ended April 30, 1952, to show the extent to which member roads are following A.A.R. standards. Of 19,872 box cars reported, only two were not A.A.R. standard, and 1,000 are standard except for dimensions and the inclusion of floating center sills. The remainder are about evenly divided between cars which are A.A.R. throughout and cars which vary from standard in dimensions only.

Of 13,430 50- and 70-ton hopper cars, 4,500 are not A.A.R. standard, 5,750 are standard except for dimensions, and 3,180 are A.A.R. standard throughout. Of both types of cars only 13.5 per cent are not A.A.R. standard in any respect. Of a total of 18,282 cars of types for which there are no standard designs, all except 1,722 had center-plate heights of 25¾ in.

Center of Gravity Height

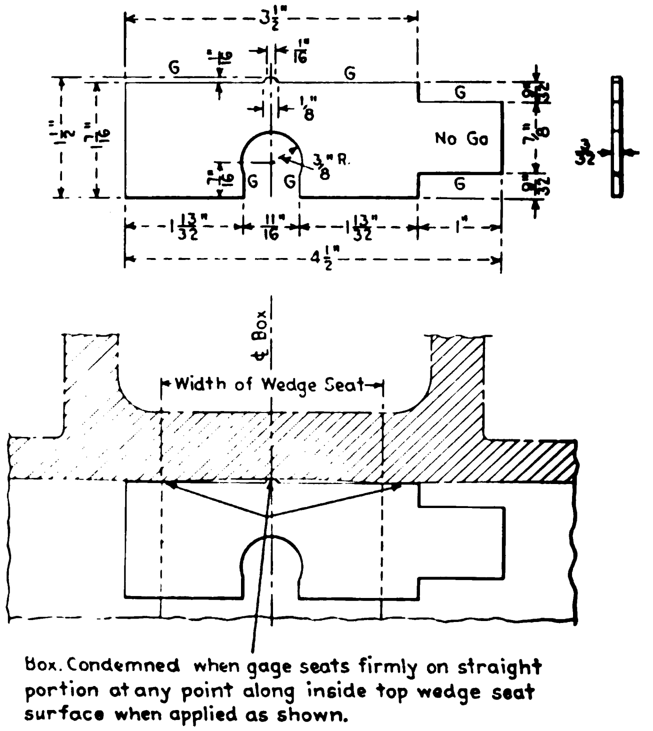
The committee recommends that a height above rail of 84 in. for the center of gravity of a car, loaded or empty, be the maximum that should be offered for inter-change service without the possibility of incurring charges for special handling. This is the result of a study of recommendations of the Engineering Division and investigation of the maximum speeds on curves of various railroads. The committee also recommends that the subject be referred to the Operating-Transportation Division for inclusion in the Car Service Rules.

Passenger Car Outlines for Unrestricted Operation

An outline diagram, similar to that for freight cars, now shown as Plate B in the Manual, has been developed for Passenger cars and is submitted for letter ballot action. If adopted, it will become Plate P in the Manual.

Condition of Auto Loading Devices

Auto-loading devices in cars offered to the automobile industry have frequently been in unsafe condition. Lubrication of this equipment has been neglected and a lubrication chart has been prepared and is recommended for letter ballot action. It is also proposed to place the placard showing the date of last lubrication on the side wall of the car near the door instead of on the end where it can not be seen without getting into the car and frequently requires a light.



Limit of wear gage for journal-box hinge pin, hinge-pin holes and wedge seat in box ceiling.

Refrigerator-Car Tests

Test runs of cars loaded with Italian prunes with ice and two per cent salt, between Oregon and Chicago and the east, using three types of fans, and of oranges between California and the eastern seaboard, using four types of fans, have established that the use of built-in fans are as effective for precooling as the stationary or portable type used by shippers, and that they precool for less cost. A series of trips between Chicago and New York were made to determine whether the present rule of filling the bunker by reicing at destination is necessary to maintain proper temperature. The data developed that, in general, if the ice in the bunker was maintained at a level one-half or more of bunker capacity, proper temperatures were maintained.

Mounted-Wheel Car

In collaboration with the Committee on Wheels, the Car Construction Committee studied the matter of developing a suitable design of car for transporting mounted wheels. Drawings covering the proposed design were included in the report and should be helpful in eliminating damage which occurs in transporting wheels mounted in ordinary flat or gondola cars secured by various kinds of special locking which has to be applied when wheels are loaded and removed when they are unloaded.

Control of Side-Frame Failures

During the past year 18 additional designs of truck side frames and 23 additional designs of truck bolsters have been approved. The sub-committee is now giving consideration on how to eliminate inadequate designs from service. The rules of interchange now outlaw T- and L- section frames, effective January 1, 1953. But some U-section frames are little, if any, better and these poorer frames cannot be weeded out solely on the basis of age. It is considered economically unjustifiable at present to bar all designs without A.A.R. approval for interchange service. The committee is of the opinion that the only rule which could outlaw the bad frames and permit the good ones to remain in service must be based on manufacturers' pattern numbers. Before this can be done a comprehensive list of service failures must be available. Success along this line can only be obtained if enough large member roads issue instructions that a record of all side-frame failures be reported to the A.A.R., giving the manufacturer's name and pattern number.

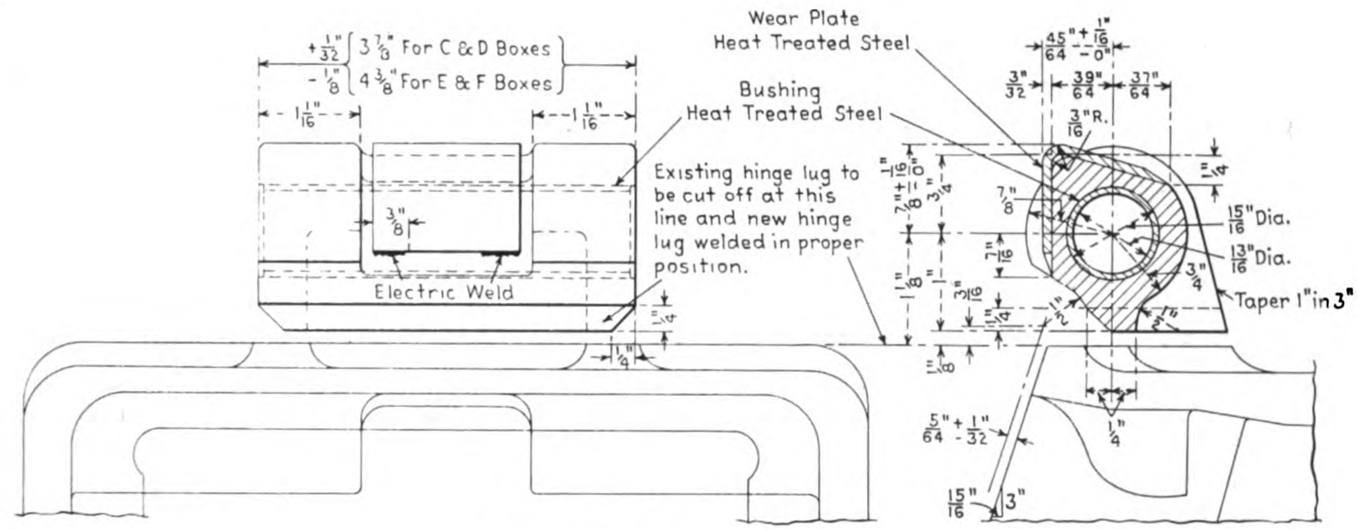
The discussion drew attention to the fact that not all frames failed because of weakness of the design. Corrosion is also a cause. Some form of chemical rust inhibitor, if one can be developed, was suggested as a means of prolonging the life of these castings. Cement is not satisfactory because it conceals defects from inspection.

Life Expectancy of Snubbing Devices

The delivery of hydraulic testing machine now on order for use in determining the life expectancy of snubber groups, package units and built-in snubbers is tentatively set for October 1, 1952. This machine simulates road conditions more closely than the drop-test machine at Purdue University which it was first planned to use. Practically all the equipment which it was planned to use in the drop tests can be used with the new equipment. This project was highly recommended in the discussion. One member called attention to the report of a special committee on damage to dressed beef to the National Freight Loss and Damage Committee of the Freight Loss and Damage Section, Operating and Transportation Division, A.A.R., in which a large amount of damage to meat hindquarters in refrigerator cars is attributed to truck conditions.

Wear Limits of Journal-Box Hinge Lugs, Hinge-Pin Holes and Wedge Seats

An extensive investigation of worn hinge-pin lugs and hinge-lug pin holes on journal boxes has developed that the principal reason for wear is the poor alignment of the lug with respect to the face of the box. In conjunction with the truck manufacturers' committee and independent manufacturers a number of gages were developed, submitted to letter ballot and added to the Manual. These gages at the time of manufacture insure the proper alignment of lugs and provide a tight fit between lids and box faces. This reduces the wear on the pins, lugs and lids.



The application of replacement hinge lug.

The use of a roller instead of flat plate between hinge lug and spring assists materially in reducing wear on the lug.

Hardened-steel wear plates and bushings for application to lugs on new boxes were also added to the Manual as recommended practice. Their use does not improve the lid fit on new boxes, but they provide increased life for lugs in that both wear plates and bushings may be replaced if worn. These details are patented and it is recommended that their use be left to the choice of the individual railroad.

The committee deemed it inadvisable to recommend the application of bushings and wear plates to worn holes and lugs of existing side frames and saparable boxes.

For letter-ballot action the committee recommends a new Rule 24 in the Interchange Code prohibiting the application of second-hand or reconditioned separable journal boxes or truck side frames if the pin holes in the lug are enlarged to 7/8 in. diameter or more and if the hinge lug is worn to 3/32 in. less than the minimum distance for a new lug when measured from the edge of the pin hole to the apex of the lug radius, or if the contour of the ceiling of the box at the wedge fit is worn to a depth equal to or more than 1/16 in. The cages for determining these dimensions are included in this summary of the report.

Reclamation of Journal-Bearing Wedges

For letter ballot action the committee recommends a change in Interchange Rule 23 permitting journal-bearing wedges to be reclaimed by machine grinding or reforging, provided the original contour of the wedge is restored without reducing the nominal thickness of the crown more than 3/32 in.

Icing Damage to Metal Running Boards

The attention of the committee has been directed to the damaging of end sections of metal running boards when icing refrigerator cars where the ice cakes strike the running board before entering the far hatch opening. The committee's opinion is that it is inconsistent to require safety appliance details to be constructed so as to withstand unfair usage such as dropping heavy cakes of ice on them. It was suggested that skids be used for carrying the cakes across to the far hatch opening without contacting the running board.

Several new designs of metal running board, approved by the Car Construction Committee, have been referred to the Safety Appliance Committee for concurrence.

A meeting of a joint subcommittee of representatives of the Safety Appliances, Car Construction, and Arbitration Committees was held to determine under what conditions the running boards can be welded. Recommendations are now in the hands of the committee for approval.

Revised Brake-Beam Camber

The committee recommends that the requirements for brake-beam camber shown on Manual pages E-85 and E-86 be changed from 7/8 in. plus or minus 1/8 in. to plus 1/4, minus 1/8. The increase in the tolerance for new beams will permit the manufacturers to increase the camber sufficiently to compensate for the loss of camber in service.

Section III, Paragraph (b), of Specifications for the Repairs to Certified Brake Beams for Freight Equipment now provides that tension members must be scraped when worn more than 1/32 in. Tension members of Unit type beams will stand more cross-sectional reduction in area than now permitted. The concensus of opinion of the committee is that an exception as between cast-steel and solid-truss beam of the Unit type and other types should be made until such time as experience may demonstrate that changes that are not obvious now are desirable.

A proposed exception for the Unit and Davis type beams from the hammer test near each end at the back of the compression member while under proof test is not agreed to by the committee because the hammer tests requires only a few seconds and may occasioanlly disclose a defective condition which would not otherwise have been discovered.

Bottom-Rod and Brake-Beam Safety Supports

Special attention was given to the matter of existing designs of bottom-rod and brake-beam safety supports. Down through the years, a substantial number of such devices have been approved by this committee, but it has been found that many of the older designs are not suitable for present day operation. The committee assembled data pertaining to all of these devices and those not meeting present day requirements will be eliminated in the interest of preventing train accidents by reason of failure of these devices.

In the discussion one member advocated developing more satisfactory supports or eliminating them altogether. Some of them have a multiplicity of parts and he believed were the cause of more accidents than dropped brake beams.

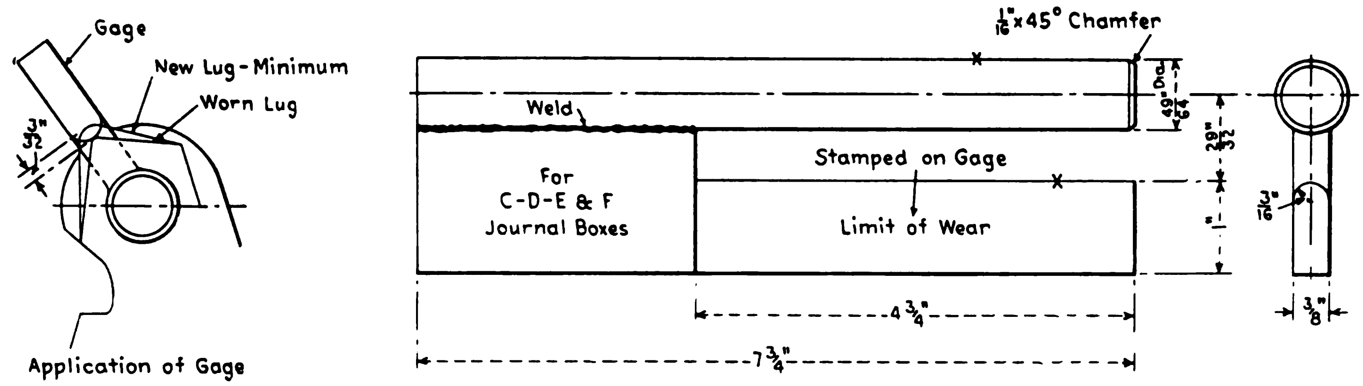
Welding Z-Section Center Sills

In order to eliminate the possibility of undesirable welding it was recommended for letter ballot action that the note on page C-6 of the Manual be modified by eliminating the permissibility of intermittent welding and providing only for a continuous electric weld penetration minimum 30 per cent full length.

It has been discovered that cracks have developed in the 1941 design lightweight body-bolster center filler, in the transverse rib.

Bolster Center Filler Revised

Impact tests of cars with the original and a modified design of the center filler clearly demonstrated that the stresses are way beyond proper limits in the original 1941 designs, but that under identical conditions the stresses in the modified design are well within well accepted design limits. For letter ballot action it is



Limit of wear of hinge is indicated when distance from edge of pin hole to apex of lug radius permits gage to pass over lugs of journal boxes C, D, E and F.

proposed that all plates in the Supplement to the Manual showing the 1941 center filler incorporate the modified design.

Retaining Valves on Open-Top Cars

The present specifications on Manual pages E-66 and E-67 is based on measurement from the top of the car and does not always provide adequate clearance above the retaining valve. The proposed change specifies a clearance of 6 in. between top of retainer and any obstruction above to permit application of exhaust gage fitting for testing retainer and brake-cylinder leakage.

Strap Anchors on Flat Cars

The report covers additional design of anchorage for securing lading straps and wire to gondola cars, also an anchorage arrangement for application to flat cars. The use of anchorage devices to permit safe securement of loads has met with great favor by the shippers as it enables them readily to secure their lading to cars with minimum time and expense. It also eliminates the necessity of cutting holes in car sides or elsewhere for securement of lading straps or wires, thereby avoiding equipment abuse.

One discusser thought the anchorage arrangement for flat cars should be made standard rather than recommended practice. He called attention to the failure of straps secured to anchorages attached to the sides of open-top cars, by cutting on the edge of the top chord member of the car side.

A and B Ends of Passenger Cars

In order to provide uniformity and convenience in designating sides, ends, journals, and journal-box locations on passenger cars, it is recommended for addition to Section L of the Manual that the B end be defined as the end on which the hand brake is located; if the car has two hand brakes, the B end is that toward which the piston of a body-mounted cylinder moves in a brake application, or the end on which the retaining valve is located; or the vestibule end. If none of these definitions is applicable, the owner shall designate the B end. Wheels, journal boxes and contained parts will be numbered starting at the B end, one on the right, two on the left, etc.; or, facing the B end, numbered R1, R2, etc., on the right, and L1, L2, etc., on the left. In case of conflict on self-propelled cars, locomotive designating system will supercede car designating system. In identifying equipment under the car, facing the B end, the parts will be named and the side of the car indicated as right or left. Where more than one part, such as battery boxes, are under the car, these will be indicated as first (the nearest) and second, and the side of the car designated as left or right.

Location of Routing-Card Boards

To increase the convenience of the location of routing-card boards, particularly for application in train yards, it is proposed for letter ballot action that the last paragraph of Manual page C-42-1949 be changed to read as follows: "On other than house cars card boards must be located on each side of the car near bottom at left-hand end facing side of car, or on outer end of end sill. On cars equipped with center sills only, card boards must be located near center of car, attached to outer end on running-board support, or to outer end of body bolster."

Designating Material Thicknesses

It has been decided that hereafter A.A.R. prints involving thicknesses of material will have the thickness shown in decimals rather than the gage of the material.

Car Designating Letters

The committee proposes for letter ballot action the addition of a number of definitions of freight and passenger cars. Box cars having A.A.R. classification XME, when insulated, will be designated Class XMEI. To differentiate between LO covered hopper cars and plain hopper cars equipped with roofs, the latter will be identified with the letter R affixed to the regular symbol. CSB cars now defined as combined sleeping and baggage cars will be redefined as baggage-dormitory cars in order to eliminate improper assignment.

On recommendation of the Committee on Tank Cars the General Committee, as of June 15, 1951, approved specifications Class AAR-205A300-W and authorized tank cars conforming thereto for use in the transportation of nitrogen fertilizer solution, inhibited, a commodity not coming within the scope of the I.C.C. Regulations for the Transportation of Explosives and Other Dangerous Articles. It is proposed for letter ballot action that this specification be added to the list of tank-car specifications now designated under the classification TM.

Insect Infestation of Box Cars

The presence of weevils, or other insect pests, in any quantity in a freight car frequently results in rejection of the entire consignment. Even if the commodity itself is not subject to infestation, the presence of these insects may infest the consignee's property. There is also the possibility of condemnation under the Pure Food Act of the entire consignment by federal or state authorities. The committee reports that more thorough cleaning of existing cars has been responsible for improving the condition of cars offered for the shipment of grain and food products, and sets forth an inspection procedure and methods for dealing with cars which are infested. Concerted action by railroads and shippers, it is believed, will still further reduce the infestations.

In the Construction of Sleeping Cars

The members of the committee are J. A. Gower (chairman), assistant mechanical engineer, PRR; F. G. Moody (vice-chairman), superintendent car department, NP; R. B. Winship, mechanical engineer, CPR; J. McMullen, consulting engineer, Erie; R. H. Graff, assistant engineer, car equipment, NYC; H. L. Price, Mechanical assistant (car), AT&SF; F. J. Herter, engineer car canstruction, C&O; H. L. Holland, assistant mechanical engineer, B&O; N. A. Passur, engineer car construction, SP; F. Fahland, general mechanical engineer, UP; K. H. Carpenter, superintendent car department, DL&W; W. A. Pownall, assistant to general superintendent motive power, Wabash; W. F. Kascal, mechanical superintendent, T&P; J. R. Douglass, assistant superintendent shops, L&N.

(The report was accepted and recommendations referred to letter ballot.)

Locomotive Construction

Auxiliary Air Supply on Diesel Locomotives

Amended I. C. C. Rule 205 (a) is now fully effective and presumably all carriers involved are complying with the rule as written insofar as having a separate supply of air available, suitably protected by check valves, for the operation of pneumatically actuated controls, is concerned. There appears however to be some need for unification or clarification of the definition of what constitutes a complete cycle of reversal of control equipment in making the test required under the rule. E. H. Davidson, director, Bureau of Locomotive Inspection, Interstate Commerce Commission, in his letter of January 31, 1951 set forth a definition, included in the 1951 report as follows:

"For the purpose of the rule we consider one cycle may be defined as operation of controls actuated by air pressure incident to following described movements:

Throttle lever: Movement from full open to closed position and then to full open position.

Reverse lever: Movement from position for forward movement to neutral position and then to position for reverse movement.

Transition lever: Movement from full advanced position to 'off' position and then to full advanced position."

In the same letter Mr. Davidson commented further as follows:

"I would emphasize that the number of cycles specified in the rule represents minimum requirements for purpose of test only and is not necessarily intended as a measure of quantity of air required for manipulation of controls in order to stop a locomotive. Such quantity determination is a responsibility of the railroad company. The size of control air reservoirs probably will vary as affected by the character of service, gradients, size of locomotive units and other characteristics of individual railroads. I presume that you will bring the distinction between testing under the rule and operating instructions to the attention of your member railroads."

While the definition as outlined above appears simple and clear, it seems to be subject to some variation in interpretation. This is particularly true in the case of locomotives with automatic transition. On such locomotives, movement of the transition lever actuates only the first step in the transition. Subsequent steps are actuated automatically, requiring no further movement of the transition lever. In this particular case, one interpretation of the definition requires the Carriers to provide artificial means for actuating any steps of transition beyond the first, the number of steps depending on the number of transitions provided on the locomotive. If this interpretation is to be uniformly applied, it appears that the definition should so state. It should be pointed out however that in the utilization of the supply of air required under Rule 205 (a) for accomplishing the ultimate purpose of the rule, namely the plugging of the traction motors, actuating contactors beyond the first step in transition is not involved.

In the preliminary stages of the investigation by the joint committee which handled the docket for the Association of American Railroads, numerous tests were conducted which would indicate that the existing supply of air on a majority of the locomotives in service was sufficient to comply with the procedure outlined in the definition if leakage of air from the control system was properly controlled. This applied primarily to locomotives with manual transition in either road or switching service. However, some railroads, in attempting artificially to actuate the controls for successive steps of transition on locomotives with automatic transition, find that they have difficulty in performing the three cycles of reversal of control equipment as required by the rule with the existing supply of air.

The committee has also received reports that on some of the earlier General Motors road locomotives with pneumatically actuated throttle control, an interpretation has been placed on the rule that requires that these pneumatically actuated throttle controls receive their air supply from the protected reservoir. In view of the fact that these throttle controls are not involved in the procedure of plugging the traction motors, it was recommended by the builder that the air supply for the throttle controls be changed so that it would not be taken from the protected air supply. Some exception apparently has been taken to this recommendation.

The committee has had some correspondence with Mr. Davidson with the view toward having the definition clarified, particularly with respect to the locomotives with automatic transition and the pneumatically actuated throttle controls, as mentioned above. The matter is being handled further with the General Committee. At this time, however, it appears important to point out to the Members that, if the above interpretations are made final, some difficulty will be had in making the three tests required under the rule without increasing the protected air supply. The efforts of the committee were to the effect that the definition of what constitutes a complete reversal of control equipment should follow more closely the procedure required in plugging the traction motors and utilizing only such controls as are available to the enginemen in this emergency procedure. While, as Mr. Davidson points out, the number of cycles specified in the rule represents minimum requirements for purpose of test only and is not necessarily intended as a measure of quantity of air required for manipulation of controls in order to stop a locomotive, it does not appear to the committee that these items can logically be separated. The purpose of the protected supply of air is solely to give enginemen an emergency means of stopping a locomotive which is otherwise out of control.

It should also be pointed out that in the report of the joint committee it was suggested that the dynamic brake lever, if present, be included in the test of reversals of control equipment. This feature is not mentioned in Mr. Davidson's definition and therefore need not be included in any official tests under the rule. This in spite of the fact that the instructions to the enginemen should remain as originally recommended, namely that the enginemen attempt to apply the dynamic brake in the usual manner.

Rule 205 (a) and Budd RDC Cars

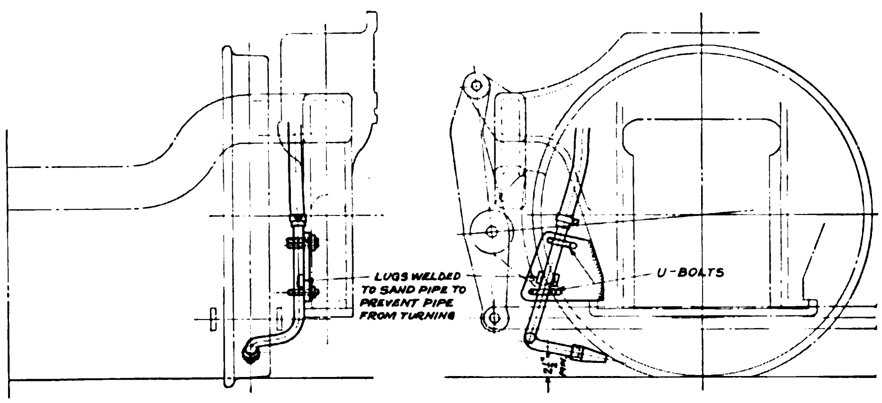
The Bureau of Locomotive Inspection has called to the attention of owners of Budd RDC cars, the necessity of having such cars comply with Rule 205 (a) in that there were pneumatically actuated power controls on such cars. The matter has been handled with the owners and for the benefit of Members who are contemplating the acquisition of Budd RDC cars, the following brief summary is included:

As originally built, the Budd RDC cars utilized a power cut-off switch. In the event of emergency application of the air brakes, this switch, by means of electro-pneumatic devices, reduced the engine speed to idle and disconnected the engine from the torque converter. Inasmuch as the braking effect of the engine and torque converter was not considered a reliable means for stopping a car otherwise out of control, it was agreed that the power-cut-off switch on existing units would be permanently nullified, thus removing this control from the scope of Rule 205 (a). The only other pneumatically actuated control on these cars is an engine water diverting valve, which, under control of the engine cooling water temperature, circulates the cooling water through the engine and to the storage tank, and when more cooling is needed, diverts the water through the cooling radiators mounted on the roof. A small air reservoir protected by a check is required for compliance with Rule 205 (a). Future cars will, of course, be equipped by the builder so as to be in compliance with the rule in the above mentioned respects.

Bracketing of Sand Pipes

The practice of supporting the sand pipes on the brake rigging that is followed by the builders of diesel-electric locomotives has several objectionable features. The delivery of sand in relation to the line of contact of wheel and rail varies greatly when brakes are in release, that is, the position when sanding for maintaining tractive force and when brakes are applied, and particularly so when brake shoes are worn thin. The delivery must necessarily be positioned to provide effective sanding for the latter condition, with the result that it is not the most favorable for traction. Another objection is the influence that wear in the brake rigging has on the lateral positioning of the sand delivery on the rail. There is also the problem of getting the maintainers to make the required allowance for shoe wear to avoid cutting out the sand pipes and delivery nozzles from contact with the wheels.

The accompanying drawing shows an effective application recommended by the committee. It is to be observed from the



Method of applying sand-pipe brackets to diesel locomotive truck frames.

drawing that with the application of the lugs to the pipe to provide a flat face to the brackets and the U-bolt clamping arrangement the sand pipe can be positively secured in its applied position to maintain an unvarying sand delivery relative to line of wheel to rail contact. The rather severe pipe bends that are necessary in this application are reported as not promoting a rapid cutting out of the pipes.

The diesel section of the report also made recommendations with respect to mounting control devices on journal boxes; the standardization of a number of diesel-electric locomotive items and a detailed progress report on road service tests of wheel slide detecting devices on three roads; the New York Central, Pennsylvania and Chicago & North Western. The devices reported on were developed by American Brake Shoe Co., General Electric, Spring Packing Corp. and Adams & Westlake.

The committee expressed opinion in favor of continuing the present air brake equipment on diesel-electric locomotives rather than to apply a modified ET6 type to road switcher in order to make it possible to operate these switchers in trains with road power now equipped with 24RL.

The committee is also studying the question of the strength of diesel-electric locomotive underframes. Replies to a questionnaire sent to 33 roads indicate that while the original complaints mentioned mostly damage to sills or damage to underframes between bolsters, replies from some of the roads indicate no trouble at such points but do indicate failures of the bolster and center plate arrangement.

This matter has been discussed with representatives of the locomotive builders and they fully understand this problem.

The steam locomotive section of the report (1) brought up to date the status of 34 welded boilers and 78 welded boiler shells now in service and 33 more on order; (2) recommended, as a letter ballot item, a number of revisions in the rules for storing steam locomotives; (3) changes in manual pages covering the welding neck flanges and (4) made recommendations with respect to multiple bearing crossheads and guides.

The gas turbine section of the report brings up to date the status of the several developments. The Union Pacific's four American Locomotive Company-General Electric units are described in Mr. Fohland's discussion which follows this report and the four other United States developments were described as follows:

Westinghouse Oil-fired Gas Turbine Locomotive

The Westinghouse-Baldwin 4,000 horsepower gas turbine locomotive was completed May 1, 1950. Last year's report covered the operation of this locomotive from its completion to March, 1951.

On March 26, 1951, the locomotive was placed in experimental freight and passenger service on the Pittsburgh & Lake Erie, operating on residual oil. This operation was generally satisfactory, but service experience indicated that certain improvements could be effected in the controls and in the method of burning and handling residual fuels.

Westinghouse developed a disc type rotor for the turbines, which was an improvement over the single piece forged rotors originally used in these turbines.

After several months of operation, it was decided to remove the locomotive from service to effect modifications which operating experience on the Pittsburgh & Lake Erie had shown to be desirable, and to replace the original turbine rotors with the new disc rotors.

This locomotive incorporates a novel wheel arrangement, being carried on four four-wheel trucks without the use of span bolsters. This type of running gear had not been used previously. In service, at speeds up to 85 m.p.h., the riding qualities of the locomotive are excellent, and no troubles have been experienced with the trucks.

During the latter part of the year, the locomotive was in the Baldwin-Lima-Hamilton plant having modifications made, after which the units were subjected to repeated load tests, starting tests, and operation to check the performance of the new controls, many of which have been made automatic.

The locomotive was delivered to the Pennsylvania and made its first run on February 19, 1952. It is assigned to baggage and express train service, handling a normal consist of 29 cars, 2,000 tons, between Harrisburg, Pa. and Altoona. Practically all of this operation has been with residual No. 6 fuel oil. Operation on the residual fuel has in general been satisfactory. The locomotive develops approximately 5 per cent additional horsepower above the rating with this fuel.

The total accumulated mileage since the locomotive was built to March 15, 1952 is approximately 13,000.

Coal-Burning Gas Turbine

Following the successful operation of a full-scale Houdry gas turbine unit for 1,000 hours, using pulverized coal, research activities on the Allis-Chalmers 4,200 horsepower gas turbine locomotive unit were accelerated.

A stationary test plant, using full-size components required for the locomotive, has been set up at the Alco Products Division of the American Locomotive Company, Dunkirk, N. Y. As with any major research activity, it has been necessary to make changes as test procedures dictate, and the plant is now set up to burn coal in developing up to full horsepower loads.

Tests are now being made on coal, and it has been decided that after 750 hours of operation is reached it will be shut down and the principal components, particularly the gas turbine, closely examined, and the over all plant appraised which will dictate future planning.

A more detailed report will be available in the next several months as to the results obtained after 750 hours under comparatively full temperature and load conditions, burning coal.

The project of building a second pulverized coal-fired gas turbine, using the Elliott turbine and compressor, has been abandoned.

Santa Fe Oil-Fired Gas Turbine Locomotive

The Santa Fe 3,750 horsepower gas turbine passenger locomotive project, utilizing an Elliott oil-burning gas turbine and being built by the Baldwin-Lima-Hamilton Corporation, has been abandoned. The reason for this action was the delay by the manu-

facturers in producing a satisfactory gas turbine and compressor combination.

Baldwin-Lima-Hamilton Corporation Free-Piston Gas Turbine Locomotive

The Baldwin-Lima-Hamilton Corporation's free-piston 3,200 horsepower gas turbine locomotive is still under consideration. This project is an experimental one, and is closely allied with development work on gas generators that the Corporation is carrying on for the Navy. All work on the Navy project is classified as restricted.

When security measures now prohibiting a report of progress of this development are lifted, a complete report will be rendered.

Foreign Gas Turbine Locomotives

The first gas turbine locomotive, No. 18000, to be used in British railway service, is a 2,500 horsepower Brown-Bovari oil-burning unit which is assigned in experimental passenger service.

After correction of a fatigue failure which occurred in the first row of turbine blading, the performance of this locomotive has been satisfactory. It is essentially similar to the original Brown-Bovari locomotive, using a single shaft turbine with a regenerator. Its overall thermal efficiency is reported to be 16.9 per cent. The locomotive has performed well, but was largely out of service during the past winter because its train heating boiler was inadequate.

A second gas turbine electric locomotive, designed and constructed by the Metropolitan Vickers Electric Company, Ltd. for use on the Western Region of the British Railways, has been delivered and is being prepared for main line service.

This locomotive, No. 18100, will be the first all-British unit. The power plant is a 3,500 hp. open cycle unit, similar to the GE turbine in its arrangement. Locomotive No. 18100 is of single cab construction, arranged for double-end operation, and is 66 ft. 8 in. overall in length. The total weight is 129 tons 100 lb. The maximum tractive effort is 60,000 lb. and continuous tractive force is 30,000 lb. The maximum gas temperature is 700 deg. C. (1,292 deg. F.). It has two six-wheel trucks, and is geared for 90 m.p.h.

It is reported that the North British Locomotive Company is building a pulverized coal-burning gas turbine locomotive for the British Railways, using a Parsons power plant. This unit is being developed in conjunction with the Industrial Research Council.

The report was prepared by a committee of which A. C. Hoppe, engineer research and development, Milwaukee Road, was chairman. Three vice-chairman, of the steam, diesel and gas turbine locomotive sections, respectively, were C. H. Knowlton, assistant engineer equipment, NYC, G. F. Wiles, superintendent motive power, B&O (eastern region) and H. C. Wyatt, assistant general superintendent motive power, N&W.

Discussion

F. Fahland, general mechanical engineer, Union Pacific, gave the following up-to-the-minute report on that road's gas turbine locomotives.

"The first gas turbine locomotive, No. 51, was placed in service January 31 of this year; the second on April 9, the third on May 7, and the fourth on June 4. The Union Pacific now has four gas turbine electric locomotives in freight service on the 176-mile district between Ogden, Utah and Green River, Wyoming. The track in this territory has a maximum grade eastbound, Ogden to Wasatch, of 1.14 per cent, and a maximum westbound, Green River to Evanston, of .82 per cent. The locomotives are handling up to 5,000 tons over the .82 per cent grade westbound.

"For the three-month period, January 31 to April 30, which locomotive No. 51 has been in service, it has traveled a total of 26,825 miles, producing 104,436 thousand gross ton miles. During this time, 419,123 gallons of turbine fuel and 28,170 gallons of diesel fuel have been used. The turbine has operated a total of 1,233 hours, using 4.28 gallons of fuel per thousand gross ton miles. The availability of locomotive 51 during this period was roughly 76 per cent. It is expected that the availability for the other locomotives will be higher because they have not been subject to the combustion chamber troubles which were experienced with 51.

"The gas turbine locomotive has a performance characteristic which recalls the best of the steam locomotive; namely, it has the surplus of power which is available for acceleration. Road foremen who have followed these locomotives report that the single unit 4,500-hp gas turbine electric locomotive will start approximately the same train as a three-unit 4,500-hp diesel locomotive. The gas turbine will accelerate from a starting speed to a maximum speed much faster than the diesel units. This will provide for better time over the road and is a step away from the drag performance associated with diesel operation.

"Performance of the gas turbine locomotives may be considered satisfactory; however, we do not mean to imply that there have been no mechanical defects. The gas turbine like any and all mechanical equipment received by the railroads, is subject to some failures. Being a new type of motive power with considerable new equipment and parts, it is only reasonable to expect that so-called "bugs" will show up. One defect in the power plant which appeared and is being corrected is that the first stage nozzle retaining bolts broke and the loose heads caused excessive thrust on the turbine rotor, resulting in the failure of the thrust bearings. This failure occurred on the first turbine after approximately 1,100 hours. The manufacturer has made necessary design changes and a program to progressively modify the turbines now in service is underway.

"Like the diesel locomotives, the gas turbine electric locomotive is heir to all the shortcomings that are inherent with electric drives. The problem of applying tractive force equally among eight drive axles becomes more difficult with the surplus power from the four main generators and the horsepower weight ratio available on these locomotives. The designers of electric driven locomotives, in general, have not paid sufficient attention to static weight distribution and the dynamic effects of center plate load shifting. In an effort to correct the weight distribution on the gas turbine locomotives, some ballast has been added to the span bolster just ahead of the front truck.

"Another feature on the gas turbine common to the electric drives is that stresses in pinion gears are approaching the limit. The only answer to this problem would appear to be better material and more care in the manufacture to eliminate defects which may act as stress risers.

"Operation of the gas turbine electric locomotive has brought out clearly the need for extensive research in solving the fuel problem and the combustion chamber design. We currently inspect combustion chambers every 100 hours and it is necessary to replace some stainless steel liner sections at each inspection. The time required to inspect and replace sections has, however, been reduced to a tolerable period. Fuel atomizing nozzles are replaced every 50 hours at present because of short-lived synthetic seals in the spray heads. Again this situation is tolerable from the standpoint of servicing time, but leaves room for improvement.

"To obtain additional data on the effects of fuels on combustion chambers, air nozzles and turbine blades, the gas turbine electric locomotives have been operated on straight diesel fuel, a heavy diesel fuel, a low ash residual fuel, and a special grade of desalted Bunker C fuel. All four turbines are currently using the special grade of Bunker C fuel which has been desalted and treated to meet a ratio of vanadium, sodium and calcium requested by General Electric. This special fuel is slightly higher than the regular Bunker C fuel and requires special handling and facilities.

"Since the use of the gas turbines in gas pumping service, using natural gas for fuel, has given excellent performance and parts life, we are considering the possibility of burning propane gas in one of the locomotives.

"The locomotives are considered as undergoing an accelerated service test and every reasonable effort is being made to reduce out-of-service time. Only the regular train crews are riding the locomotives, but experienced men board the locomotives on arrival at the terminals, check over the work to be done, and are ready to instruct servicing forces on the necessary work as soon as the locomotives arrive at the service pit. At the pit, the locomotives are given a running gear inspection while being fueled, sanded, watered, and cleaned. All inspection and supervision is gradually being turned over to the normal forces. It is expected that operating and maintenance forces will require time to become acquainted with all of the equipment which these locomotives contain and as most of you know experience with new equipment must be gained the hard way.

"Most of the engine crews prefer assignment to a turbine rather than a steam locomotive. There are, however, a few men who are hesitant about working with new machinery.

"There have been very few complaints of excessive noise and actually there is less noise in the cab of the gas turbine than in a diesel locomotive. Also, the noise from the gas turbine does not seem to carry as far as that from the diesel. There has been no indication of trouble in tunnels or in any other way due to heat from the exhaust stack gases."

F. W. Beichley, engineering supervisor, Engineering and Service Department, Westinghouse Pacific Coast, reporting on the Westinghouse-Baldwin gas-turbine locomotive, said that its operation on the Pennsylvania was concluded on March 29 after making 27 round trips between Altoona, Pa., and Harrisburg in six weeks on two mail trains which operate non-stop on this 131-mile run five days a week on a schedule of 2 hrs. 40 min. running time. During these runs the trains averaged 29 cars westbound and 25 eastbound. Ordinarily they are powered by two Pennsylvania K-4 steam locomotives.

"Maximum speed limit for these runs," Mr. Beichley said, "was 70 m.p.h.; on several occasions the run was made in 2 hrs. 22 min., which is the scheduled time of the best train on this division. In the six-weeks' period, each run was completed on or ahead of schedule except for times when train detentions occured due to railroad-operational tieups. No detentions were attributed to gas turbines or electric drive. Routine maintenance was conducted after daily runs, enabling the locomotive to handle 93 per cent of the trains to which it was assigned in the six-weeks' schedule.

"After a few initial trips on diesel fuel for convenience and observation," Mr. Beichley continued, "runs were begun on residual fuel, after which diesel oil was used principally for hostling the locomotive with the auxiliary diesel engine-generator set and to start and shut down the gas turbines. On the basis of 93½ per cent of fuel used being residual, westbound runs averaged 3.9 gal. of fuel per thousand gross ton-miles. Eastbound runs averaged 3.5 gal."

Much favorable comment on the riding characteristics of the locomotive throughout its speed range, Mr. Beichley said, has been received from those who have ridden the locomotive with the new trucking arrangement.

The locomotive is now on the Missouri-Kansas-Texas where it began service on April 18 by pulling a revenue 74-car fast freight of 3,000 tons from Parsons, Kan., to Denison, Tex., making the required schedule.

At Denison, according to Mr. Beichly, the locomotive entered regular revenue passenger-train service between Denison and Parsons, pulling an average consist of 11 mixed passenger and mail cars on a round trip basis of 550 miles per operating day. The train from Denison to Parsons is a frequent-stop service taking 6 hrs. 45 min. Parsons-Denison is a few-stop run of 5 hrs. 30 min.

"As in the PRR operations," Mr. Beichley said, "diesel fuel was initially used with conversion to No. 6 residual the second week, after which diesel fuel was ordinarily used only for starting the turbines and purging the system before stopping. Operational procedure is to move the locomotive to the station on its auxiliary diesel, starting the turbines 5 min. before train time.

"Operation on the MKT has been excellent." From Denison to Parsons "as many as 32 stops have been made and still kept schedule." From Parsons to Denison, with few stops, "the locomotive may be brought up to 75 m.p.h., after which speed may be maintained for 20 to 30 miles with three-quarter throttle or less and an 11- or 12-car consist.

"As of June 8, 19,800 miles and 543 turbine hours had been accumulated in MKT service. In recent weeks, an average of 85 per cent of the fuel used has been No. 6 residual oil. Including initial operation on diesel fuel, average consumption has been 6.9 gal. per mile in this type service. The fuel costs of gas-turbine locomotive operation are, of course, dependent on the percentage of residual fuel burned.

"This locomotive incorporates a wast-heat boiler on one of the turbines. This has been in use supplying the major part of all steam for the train as well as heating all of the No. 6 oil for both turbines. Despite relatively high ambient temperatures, reducing steam requirements, we have been pleased with the appreciable savings effected by using turbine exhaust heat for steam."

(The report was accepted and recommendations referred to letter ballot.)

Arbitration Committee

The following principal changes were recommended:

Modification of the second paragraph of Section (c) of Rule 2 and the second paragraph of Section (a) of Rule 86, to indicate that the maximum quantity of regulatory commodities loaded in tank cars must be governed by the limitations as provided by I.C.C. regulations.

Based on recommendation of the Committee on Car Construction, addition of new Note following Section (b), Paragraph (8) of Rule 3 and modification of Section (m) of Rule 17 to avoid the use of brake beam safety supports which are difficult to properly maintain and which are frequently found defective. This committee recommended to the committee on car construction that its present review of the existing list of approved equivalent designs of brake beam safety supports be expedited with the view of withdrawing approval from all designs which have not been giving satisfactory service.

With the concurrence of the committee on tank cars, elimination of Paragraph (t) (11) of Rule 3 to provide relief to car owners in testing of safety valves or tanks of tank cars which are due for test within 30 days.

Modification of the second Paragraph of Rule 16 to eliminate the possibility of railroads doing improper caulking of seams and rivets on tanks of tank cars.

Based on recommendation of the committee on couplers and draft gears, modification of Sections (i-1), (i-6) and Note following (i-6) of Rule 17, Interpretation No. 7 of Rule 88 and Interpretation (c-7) of Rule 122, account addition of new Note 5 to Rule 101 covering authorized applications of National Rubber Cushioned Type MF-260 draft gears.

Modification of Section (a) of Rule 61 to insure better maintenance of truck details.

Contingent upon approval by the general committee, modifications of Rules 71, 75 and 82 to provide for the removal and condemnation of cast iron wheels having conditions which contribute to accelerated wear of truck parts and other defects, as well as to development of hot journals.

With the concurrence of the committee on wheels, elimination of Note 3 of Rule 73, to prevent unnecessary shopping of cars in train yards having wheels partly worn but not condemnable by gage.

Modification of Interpretations No. 3 and 5 of Rule 91 to clarify the intent and bring same in harmony with the intent of Paragraphs (b) and (c) of this Rule.

Modification of Rule 94 and Section A of Rule 112 to discourage the practice of unnecessarily cutting up badly damaged foreign and private line cars to facilitate handling and account failure to return trucks where owner requests return of car home for repairs.

Modification of Items 169-E to 169-I of Rule 101, based on results of joint study by a special subcommittee composed of members of the arbitration committee and the committee on prices for labor and materials made on nine railroads and one private car line.

Modification of Paragraph 4 and addition of new Paragraph 5 to Section B of Rule 112 to provide an equitable basis for settlement for refrigerator cars destroyed which are equipped with mechanical refrigeration.

With the concurrence of the committee on brakes and brake equipment, addition of new Section (j-3) of Passenger Car Rule 7 to insure the maintenance of hand brakes on Passenger equipped cars in operating condition.

The committee did not feel that any of the modifications included in its report necessitated submission to letter ballot.

Members of the arbitration committee are: J. A. Deppe (chairman), superintendent car department, CMStP&P; W. N. Messimer (vice-chairman), general superintendent of equipment, Merchants Despatch Transportation Corporation; H. M. Wood, assistant chief of motive power (car), PRR; R. M. Smith, vice president, Union Tank Car Company; R. E. Baker, assistant general manager (mechanical), B&M; H. L. Price, mechanical assistant, AT&SF; A. H. Gaebler, superintendent car department, General American Transportation Corporation; and E. P. Stemshorn, assistant chief of car equipment, CNR.

(The report was accepted.)

Passenger Car Specifications

Standard Floor Plans

One of the many serious problems confronting the railroads the last few years is the very great increase in cost of new passenger equipment cars. Your committee was instructed to work with a committee from the American Railway Car Institute to develop plans for various basic types of cars which could be standardized and therefore more economically produced.

Nine basic plans were agreed upon and submitted to the General Committees of the Operating-Transportation and the Mechanical Divisions. These General Committees approved the plans and submitted them to the Board of Directors of the A.A.R. who at their Meeting of November 16, 1950, unanimously approved the proposed floor plans for submission to the Member Roads as recommended practice. Prints of these floor plans were included in the bound and indexed book of "Drawings for Railway Passenger Car Standards" issued by the A.R.C.I. Passenger Car Committee which was sent to the executives of member roads with Mr. Faricy's letter of August 22, 1951.

There are 19 floor plans involved, four coaches, three coach combinations, three parlor car and parlor-car combinations, a diner and a diner lounge, and seven baggage and non-passenger baggage combinations.

The committee recommends that these floor plans be approved as Recommended Practice for inclusion in Section C of the Manual of Standard and Recommended Practices.

The committee decided at its joint meeting with the car builders' representatives on February 28, 1952, that it was inadvisable to attempt to standardize details of cars, such as alternators, lavatories, hand brakes, door holders, fans, etc. Dimensions of such details, method of mounting, etc., would inevitably be selected from particular suppliers' products to the possible exclusion of others. This might also have a tendency to stifle development of improvements is such details.

Designations and Definitions

Specifications for the construction of New Express and Baggage Cars used in Messenger and Baggageman service were adopted as Recommended Practice in 1948 at which time a three-phase program was also adopted to make available for this service as many cars as required in the shortest practicable time limit. These three phases were: (1) construction of new cars in accordance with the specification; (2) shopping of existing cars to modify them as necessary to make them meet the specification requirements; (3) take immediate steps to correct the required number of cars to meet the most important specification items without waiting for shopping of the cars.

In order to readily identify cars which had been made suitable for messenger service, these cars were stenciled with a 6-in. five-point star directly under and centered on the Railway Express Agency marking. This star identification was also adopted by Letter Ballot in 1949.

In view of the above, it is now recommended, as a letter ballot proposition, that these cars be designated "BEM" (Baggage Express Messenger) and that the description of same be added to Page L-11 of the Manual between the designations "BE" and "BH."

Proposed Standardization of Floor Plans In the Construction of Sleeping Cars

The American Railway Car Institute Committee on Passenger Car Design, consisting of representatives of the American Car and Foundry Company, Budd Company, Pullman Standard Car Manufacturing Company and the St. Louis Car Company, has been working on the development of floor plans for sleeping cars and at a joint meeting with your committee, held on February 28, 1952, presented a preliminary statement consisting of 13 points which include floor plans and related details for such cars. These are now being studied by your committee with the view to further discussion of this matter at another joint meeting.

The members of the committee are R. H. Graff (chairman), assistant engineer car equipment, NYC System; R. B. Winship, mechanical engineer, CPR; H. L. Price, mechanical assistant—cars, AT&SE; C. K. Steins, mechanical engineer, Pennsylvania; V. L. Green, assistant superintendent car department, CMStP&P; M. C. Haber, research and standards engineer, UP; G. J. Lehnerer, superintendent car department, IC system; H. W. Reynolds, mechanical engineer, N&W; F. J. Herter, special engineer, C&O; H. L. Holland, assistant mechanical engineer, B&O; W. Scowcroft, car equipment engineer, Pullman Co.; L. C. Bowes, electrical engineer, CRI&P; H. J. Dawson, traveling electrical supervisor, I.C.; W. M. Keller, director mechanical research, Mechanical Division, A.A.R.

(The report was accepted.)

Brakes and Brake Equipment

The committee made recommendations, as follows:

A gage for condemning AB cover gaskets having an overall thickness of less than 0.175 in. including bead, when valves receive periodic attention in accordance with Pamphlet No. 2391. This is a letter ballot item and, if approved, appropriate changes will be requested in Manual and Interchange Rules.

Brake Equipment for High Tare Weight Freight Cars

The committee recommended, as a letter ballot item, that the following be added to page E-13-51 of the Manual as Standard to cover Brake Equipment for High Tare Weight Freight Cars and Cars of Special Design:

"Cars having tare weight too high to permit use of AB-10 single capacity freight brake other than those requiring two (2) complete sets of AB-10 equipment, shall be equipped with a single capacity AB brake, including a 12 in. x 10 in. UAT type brake cylinder to operate at 5 in. piston travel (including the use of an automatic slack adjuster), and a badge plate specifying the 5 in. piston travel shall be applied to each side of such cars at a suitable location. All other components of the brake equipment, including retaining valve, shall be the same as for standard AB-10 single capacity brake."

Reason: To provide proper brake equipment for freight cars of high tare weight.

Air Date Stenciling on Tank Cars

The committee recommended to the Arbitration Committee that Paragraph (f) of Rule 60 be revised as follows:

Proposed Form—(f) All old cleaning marks must be scraped off and painted over with quick-drying paint, preferably black. The place, month, day and year of cleaning and the railroad or private line reporting marks, must be stenciled with white paint on the auxiliary reservoir, as shown on pages 136 and 137, or if this location does not present a clear view from outside of car, the stenciling should be located near handle of release rod on the reservoir side of car. *On tank cars, this stenciling must be located on reservoir side of center sill as close to B end of car as possible.*

Reason: To avoid obliteration of air brake cleaning date markings caused by spillage of certain commodities.

P.C. Rule 7—Periodic Inspection and Lubrication of Hand Brakes

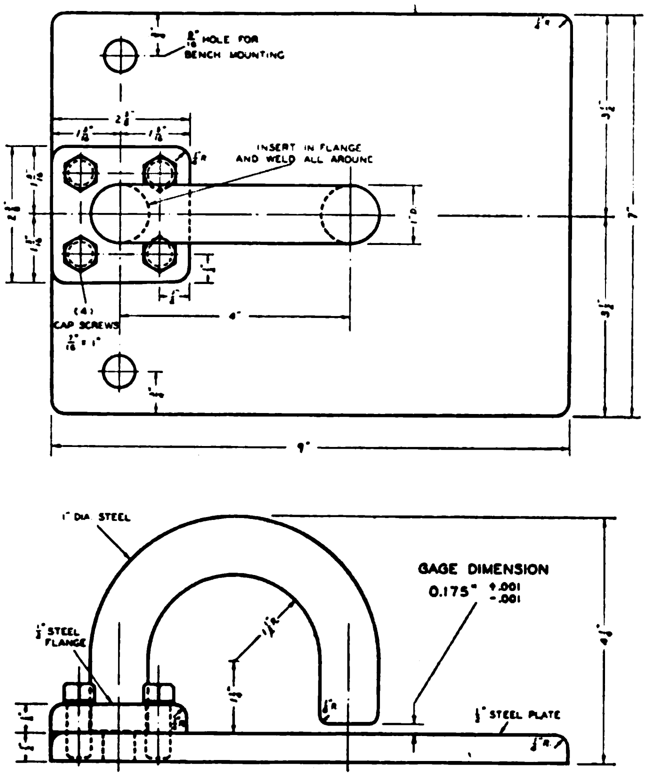
In order to insure the maintenance of hand brakes on passenger equipment cars in operating condition, it was decided to recommend to the Arbitration Committee that new Section (n) be added to P.C. Rule 7 to read as follows:

"(n) When car is on shop or repair track for cleaning of air brakes, the hand brake mechanism and connections must be inspected, tested and lubricated, to insure their suitability for safe and effective operation. No charge is permissible for this work. However, charge may be made for any repairs or renewals of details found necessary and performed."

Securing of Brake Cylinders, Auxiliary Reservoirs and Pipe Clamps

The committee recommended, as a letter ballot item, that the first paragraph under "Miscellaneous" shown on Manual page E-13-51, be revised as follows:

Proposed Form—Bolts securing brake cylinders, reservoirs and



Gage for worn AB valve cover gaskets

pipe clamps shall have double nuts, *single nut with locking feature, or single nut in combination with lock nut* or nut lock, preferably the latter.

Reason: To provide for the use of a single nut with locking feature and single nut in combination with lock nut.

The committee also reported on (1) the progress of tests on 33 Illinois Central cars with QRR brake cylinder release valves; (2) on a test of 25 Illinois Central cars with load compensating brake; (3) on a demonstration of circuit checking devices for electro-pneumatic brakes; (4) on the status of rules revisions governing the maintenance of brake and train signal equipment.

Changes in Specification No. 2518

The air brake companies, with the approval of the Brake Committee, have made certain changes in Specification No. 2518, in order to clarify the questions relative to the location of the reservoirs and AB pipe bracket, to provide flexibility in the pipes in case of any movement of the bracket or reservoir and to reduce the possibility of pipe leakage. Also, a table was added to show a minimum recommended radius bend for pipes used on the AB air brake equipment.

A revision was also made in the instructions for the application of the flanged Wabcoseal fittings.

The report concluded with a list of nine additional items under consideration.

The report was prepared by a committee of which J. P. Lantelme, assistant engineer, PRR, was chairman.

Discussion

The discussion of brakes and brake equipment centered about brake pipe leakage with particular reference to loss of air at AB cover gaskets. A representative of one road said that the present rule requiring the replacement of back covers with the new reinforced type is costing the railroad $26,000 a year and they have developed a relatively inexpensive stiffener which can be applied to prevent warping at $1.30 each. The need for effective means to charge full trains of AB equipment quicker was emphasized again at the meeting this year.

Another speaker said that leakage is not all in the AB valve by any means and that a check on one road showed 64 per cent of the leaks in the train line. He said that Rule 101 was not being lived up to and that better train yard inspection is needed.

(The report was accepted and recommendations referred to letter ballot.)

Report on Geared Hand Brakes

As of the date of this report, A.A.R. Certificates of Approval have been issued for a total of 31 types of geared hand brakes—19 vertical wheel type, 9 horizontal wheel type and 3 lever type. These were listed in the report and Interchange Rule 101 will be revised to show additional types not now included, together with changes in references as required.

Detachment of Brake Wheel Because of Worn Threads

It is recommended, as a letter ballot proposition, that Paragraph 3 of the Specification for geared hand brakes (Manual Page E-61) be modified as follows:

Proposed Form—Depth of wheel hub to be 2⅝ in. with square taper fit on shaft, taper 2 in. in 12 in., outside end of shaft to be 15⁄16 in. square. Wheel to be secured to shaft with not less than ¾ in. standard nut with lock nut or cotter, *or nut with self-locking feature plus cotter,* or end of shaft riveted over.

Reason: To provide for the use of nuts with self-locking feature.

It was also recommended, as a letter ballot item, that Paragraph 9 of the Specifications for geared hand brakes (Manual Page E-62) be modified as follows:

Proposed Form—Quick release feature may consist either of an arrangement operating independently of the brake pawl, or by operation of ratchet operating lever which can be forced into release position by hand. When quick release can be affected by either method, hand wheel should preferably not revolve in counter clockwise direction. *Graduated controlled release feature by action of the release lever when lift the load feature is incorporated, may be used.*

Reason: To provide for graduated controlled release feature by action of the release lever.

Letter Ballot Items

The following recommendations contained in the report are to be submitted for adoption by letter ballot vote:

1. Revision of Paragraph 3 of the Specifications for Geared Hand Brakes to permit the use of wheel shaft nut with self-locking feature plus cotter.
2. Revision of Paragraph 9 of the Specifications for Geared Hand Brakes to permit graduated controlled release feature by action of the release lever when lift the load feature is incorporated.

The report was prepared by a committee of which H. B. Wolfe, engineer construction, AT&SF, was chairman.

(The report was accepted and the recommendations referred to letter ballot.)

Axle and Crank-Pin Research

Progress Reports

QUENCHED AND TEMPERED CARBON STEEL AXLES

The results of fatigue testing axles to Specification No. M-126-49, Classes G and H, were included in the Eighth Progress Report, issued by the Mechanical Research Office under date of February, 1950. Substantiating data on additional axles to Class H specification verify the maximum allowable stress values previously reported for these axles.

Data were also presented on axles to Specification No. M-126-49, Class G, modified by water quenching from the tempering temperature of 110 deg. F. This additional treatment increased the resistance to breaking off in the wheel fit by 50 per cent above that obtained on Class G axles.

Experimental Design Freight Car Axles

Fatigue tests on axle forgings with wheel-seat diameters same as the standard passenger car axles, but having as forged surface between wheel seats, have been substantially completed. This portion of the study of development of a new design of freight car axle indicates that the project is feasible. These tests are being continued and will be supplemented by a series of tests on the present standard (black collar) freight-car axle, to compare the fatigue strength of the as-forged body on the two designs.

Assignments

Assignments before the committee include study of the design of a tubular axle with raised wheel seat.

Two-step journals for roller bearings on trucks with integral journal boxes have been approved by the committee, but the manufacturer has supplanted this design with a straight cylindrical journal using a single inner race diameter for both bearings.

The committee continues the study of coating materials to protect the body of axles from corrosion fatigue.

The return to service of severely burned axles without proper safeguards and observance of existing rules is potentially dangerous. But arbitrary scrapping of all axles which have been overheated could not be economically justified. The committee believes that strict observance of Rule 355 (o) of the Wheel and Axle Manual by all railroads would automatically remove from service any axles which had been "severely burned." It recommends that the executive vice-chairman of the Mechanical Division circularize member roads calling attention to the many burned off journals resulting from non-compliance with existing rules. It also proposes for letter ballot action that all axles with overheated journals reconditioned in accordance with the provisions of the current rules be identified by stencil.

Tests to determine dynamic stresses in axles showed no indication of high stresses in journal at ordinary running temperatures.

Tests to determine permissible throw or run out at center of unmachined axles indicate that a change from allowable limit of ¼ to ⅜ in. would have no appreciable effect on lading.

Crank-Pin Fatigue Tests

Summarized data from the completed fatigue tests of carbon-steel and alloy-steel steam-locomotive crank pins will be submitted to the Committee on Locomotive Construction for approval with a view to revising Plate 1, page 5, Section F, of the Manual of Standard and Recommended Practice.

The members of the committee are W. M. Keller (chairman), director mechanical research, Mechanical Division, A.A.R.; K. Cartwright, general mechanical superintendent, NY, NH&H; W. F. Collins, engineer tests, N. Y. C. system; H. L. Decker, assistant mechanical engineer, Pennsylvania; H. H. Haupt, general superintendent motive power, Central Region, Pennsylvania; F. J. Herter, special engineer, C&O; A. M. Johnsen, engineer of tests, Pullman Co.; E. J. Johnson, assistant chief engineer equipment, NYC System; E. H. Weston, assistant chief mechanical engineer, C&NW.

Discussion

The committee's recommendation that such axles reconditioned in accordance with Rule 355(o) of the Wheel and Axle Manual be identified by stenciling, was said in the discussion not to be adequate because it misses the axles which are rebrassed on the road, perhaps after cooling by quenching with water. The experience of some members that a high percentage of failed journals are found to have been turned down indicates reconditioning after overheating.

A study of overheated axles on the Pennslyvania revealed that, when Magnafluxed, 90 per cent were found with cracks too deep to be removed by turning. It was suggested, on the basis of this experience, that it would be more economical to scrap all the axles than to Magnaflux all and reclaim the 10 per cent. Another factor affecting the reclaimability of axles, the journals of which have been heated until the bearing metal has been melted out of the brass, is the effect of copper penetration which seems to weaken the steel by destroying its inter-crystalline bond. Acceptance of this as a definite effect of the contact between the hot journal and the brass bearing shell is growing.

(The report was accepted.)

Lubrication of Cars and Locomotives

The service testing of new greases has proceeded without interruption on the railroads of the Lubrication Committee members and conditional approval has been given the Richfield Oil Company for two greases which have performed satisfactorily in passenger service in various makes of bearings with mileage records from 100,000 to 300,000. The list of approved roller bearing greases is as follows:

Lubrico M-1 Special................Master Lubricants Co.
H-927 Non-Fluid Oil...............New York & New Jersey Lubricant Co.
No. 979 Roller Bearing Grease.......Texas Oil Company
Rocolube R. R. Grease (Note 1).....Richfield Oil Company
Richfield HSRB Grease (Note 1).....Richfield Oil Company

Note 1: Conditional approval given until 350,000 miles is satisfactorily attained in all makes of roller bearings.

In addition to the greases listed as having the approval of your committee, at least 20 other brands are undergoing service tests or have been discarded for reasons of instability, incompatibility with other approved greases, or other inadequacies. One brand not listed above is nearing successful completion of service tests and it also will be considered for conditional approval this year.

The road service testing of greases is considered a necessity until the proposed A.A.R. Specification for journal roller bearing grease can be developed to cover the intangible properties of a product of this nature. The subcommittee is working with a joint committee representing the major oil companies and roller bearing manufacturers which, since its organization in 1950, has reviewed the existing laboratory test methods for interpretation of resulting test data. New test methods, in varying degrees of development, will be available and may be utilized by the A.A.R. in future issues of the grease specification.

Packing Retainer Devices—Spring Type

During the year recommendations made by the Lubrication Committee to the Arbitration Committee included the proposed modification of Interpretation No. 4 of Rule 66 in the 1952 Code.

The committee's attention was directed to a number of cases where serious damage to journals and journal bearings was caused by contact with and displacement of spring type packing retainer devices in separable bolted type journal boxes. It was reported that displacement of spring packing retainer devices in such boxes is primarily caused by excessive wear on the inside of journal boxes in combination with wear on journal bearings, wedges and journals, causing excessive movement from brake applications or impacts and subsequent displacement of packing retainer devices. Your committee felt that these conditions cannot be controlled so as to avoid displacements of this nature.

It was decided, therefore, to recommend to the Arbitration Committee that the use of spring type retainers in separable boxes of bolted type in freight service be prohibited and a new note was added to Interpretation 4 of Rule 66 by the Arbitration Committee in the 1952 Code.

PACKING RETAINER DEVICES APPROVED FOR ROADS DESIRING TO USE THEM

Spring Types	Manufacturer	Design	Suitable for Integral type journal boxes without cast-in retainer ribs	Suitable for Integral type journal boxes having cast-in waste retainer ribs
Hold-Rite Packing Retainer	Spring Packing Corp.	NP-8	Yes	No
Hold-Rite Packing Retainer	Spring Packing Corp.	NP-9 & 10	Yes	No
Hold-Rite Packing Retainer	Spring Packing Corp.	NP-9 & 10 short	No	Yes
Hold-Rite Packing Retainer	Spring Packing Corp.	NP-11	Yes	No
Hold-Rite Packing Retainer	Spring Packing Corp.	NP-11 short	No	Yes
Hold-Rite Packing Retainer	Spring Packing Corp.	NP-12	Yes	No
Modern Packing Keeper	Modern Railway Devices, Inc.	8-9-10-11-12	Yes	No
Union Waste Retainer	Union Spring and Mfg. Co.	9 and 10	Yes	No
Union Waste Retainer	Union Spring and Mfg. Co.	11	Yes	No

Fig. 1—The box is mounted on the stand at the same height as a journal box on a car.

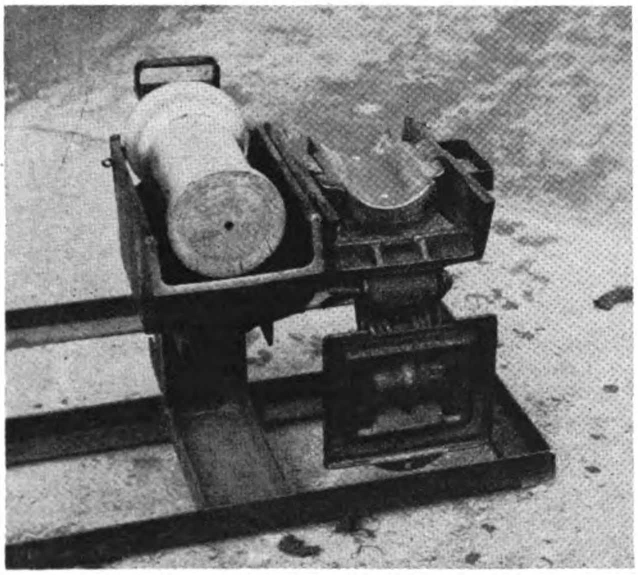


Fig. 2—The top half of the box is hinged so that it may be swung to one side.

Flex-Pak Container

The application of the Hulson Flex-Pak has been extended to 1,000 70-ton hopper cars on the Pennsylvania Railroad, 300 70-ton covered hopper cars on the Baltimore and Ohio Railroad, 50 70-ton gondola and ore cars on the Reading, and a small number of Flex-Paks are running in 50-ton box cars in special service. Reports to date are entirely satisfactory. The first of the 1,000 70-ton hopper cars on the Pennsylvania have now seen better than nine months service through severe winter conditions without reportable difficulty.

The compound of the synthetic oil-resistant rubber has been revised and tests have been made on both stationary plants and in actual impacts. In break-away tests temperatures as low as 71 deg. F. below zero have been recorded with perfect lubricating conditions. In impact tests actual boxes have been frozen to 40 deg. F. below zero and impacts to 8.6 miles per hour recorded with no damage to the Flex-Pak. Twenty-five cars in head-end express service are coming up for their fifth journal box inspection and brass change. The handling of the Flex-Paks has been satisfactory with less than 2 per cent replacement of the Flex-Paks required in this time. Flex-Paks are available in the three sizes for both integral and separable boxes and are all approved for roads desiring to use them in regular interchange service.

Anti-Waste Roll Ledge

Your committee has the assignment of making inspections of cars equipped with the Hogan Anti-Waste roll ledge, to determine the merits of this design of journal box in preventing the rolling of journal box packing.

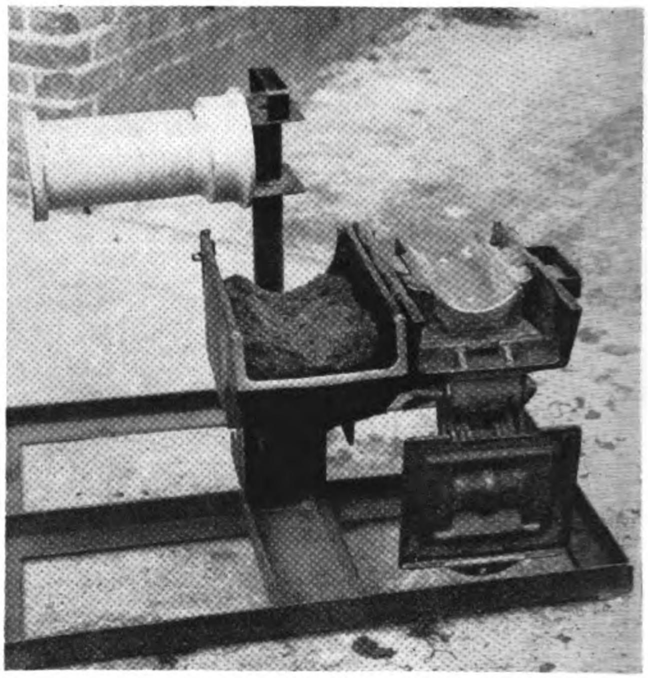


Fig. 3—After the hinged top is swung out, the journal may be lifted and turned to one side to completely expose the packing.

The New Haven Railroad has 500 box cars and 200 flat cars so equipped and advice was received last year from this road to the effect that 550 hopper cars of 70-ton capacity have been ordered to also be equipped with this feature.

The New Haven Railroad was requested to cut one of these design journal boxes from a side frame and forward it to M. A. Pinney, engineer of tests, Pennsylvania Railroad, for use in laboratory tests at low temperature to determine the merits of the design in preventing the rolling of journal box packing. This has now been done and tests as outlined above will be made for the information of your committee.

(The report here included reference to laboratory studies of journal lubricating materials, tentative new specifications for new and renovated oil, joint meetings of the committee with the Machined Waste Institute, approval of reclaimed waste from diesel engine fitters only if it meets Specifications E-M-910-50 and elimination of pages L-81 to L-91 from the A.A.R. Lubrication Manual.—Editor.)

Laudig Iron-Back Journal Bearing

As mentioned on page 36 of the 1951 Annual Report of this committee, road service tests of the Laudig iron back journal bearings were conducted throughout the year under the jurisdiction of your committee and the Mechanical Research Office.

Based on the results of such road service tests, it is now recommended, as a letter ballot proposition, that the Laudig iron back journal bearing be adopted as an alternate to the present A.A.R. Standard Specifications for lined journal bearings now covered by Specifications M-501-48. If this recommendation is approved by letter ballot, the matter will then be submitted to the Specifications Committee for preparation of suitable Specification to cover this new type journal bearing.

Although Laudig iron back bearings were developed to overcome the difficulties of "burned off" journals, it is claimed that tests have shown it has additional qualities for better service, as follows: (1) The bearing is made of a high strength back, thus more uniformly distributes the load of the car over the length of the journal; (2) the bearing having high strength and rigidity, shows great reduction in spread linings; (3) the bond of the babbitt to the back or shell of the Laudig bearing is not reduced or lost at operating temperatures prevailing with heavy loads and summer temperatures. Loose linings are eliminated.

Inferior Quality Journal Bearings

Based on reports from certain railroads with respect to the inferior condition of journal bearings received from the producers in some instances, your committee recommended that the Executive Vice-Chairman communicate with the solid journal bearing manufacturers stating that the railroads are concerned over the relatively high number of new journal bearings being received having defects which would be cause for rejection and that this would indicate some loose practices within the industry.

In handling this matter with the manufacturers, it was also recommended that mention be made to the effect it is the feeling of railroad representatives that some action should be taken to eliminate the high number of rejects, and, if no improvement is shown, action will necessarily have to be taken to have railroad inspectors destroy or in some manner deface bearings rejected.

Consideration was given to initiating action to require individual railroads initials to be cast on all bearings; also to a requirement to enable defacing of the letters "AAR" on rejected bearings. These proposals, however, are held in abeyance for the time being pending results of handling this matter with the manufacturers.

To date, replies have been received from a number of journal bearing producers and full cooperation has been promised.

Empire Journal Lubricator Device

Up to April 30, 1952, a total mileage of 1,398,771 has been made on six different railroads of cars equipped with the Empire Journal Lubricator. The success of this device prompted your Committee to instruct the secretary to advise that the Empire Journal Lubricating Device may be made for experimental application to cars which move in general interchange service, not to exceed 1,000 cars so equipped. In granting such approval it is understood that installation will be made in accordance with Drawings G-100, R-100 and S-101, including the use of grooved journal bearings. Furthermore, the committee requested copies of prints covering the type of closure used in front of journal box to retain lubricating material. All installations made on the above basis are to be reported to the secretary for further handling. This action is in accordance with the policy established by the General Committee at a meeting held on November 23, 1951.

It has been found with the use of this device that a low pour point grease gives excellent results and compares favorably with standard A.A.R. journal box oil.

Hennessy and Jeffers Lubricators

Laboratory tests of both the Hennessy and Jeffers lubricators have been made at the Indianapolis Lubrication Laboratory under the jurisdiction of the Mechanical Research Office and reports with respect to same have been furnished to your Committee. The laboratory tests indicated that these lubricators can be rated as having possibilities as satisfactory devices for the lubrication of conventional railway equipment solid journal bearings.

Your committee decided that road service tests of a sufficient number of these lubricators should be conducted on individual roads to establish the mechanical reliability and overall economics of same as a basis for approval of their use under cars in interchange service. Data has now been submitted by both companies indicating installations and service mileage and performance as applied to railroad equipment on individual roads and at the time of preparing this report consideration was being given to the matter of authorizing a limited number of installations of these devices to cars which move in general interchange service.

Journal Box Packing Instruction

On page 47 of the April 14, 1952, issue of Railway Age, there appeared an article with accompanying photographs describing a device used to good advantage on a southeastern railroad for the purpose of instructing railroad employes as to the proper method of repacking and service treating journal boxes.

Your committee has reviewed this article and feels that such educational programs, particularly where a device of this nature is used, are beneficial and should be given due consideration by all roads who have not already adopted such instruction methods in the interest of combating the hot box problem.

Referring to the illustrations, it will be noted that the top of the box is hinged so that it can be opened and the condition of journal box packing inspected after box is repacked or service treated. The journal can then be raised and swung out of the way so that a complete view of the packing is available.

The usual procedure is to instruct a box packer to pack this model box, which is set up for normal operations, and the box is then opened so that the employee can see for himself how well the job is done. This road reports that during demonstrations held with the first of these models, it was surprising to learn how many men were astonished to see what were the actual results in a job which they had assumed to be well done.

The report was signed by R. E. Coughlin (chairman), chief metallurgist and engineer tests, C&NW; E. H. Jenkins (vice-chairman), assistant general superintendent car equipment, Western Region, CNR; F. L. Morrison, general air brake engineer, IC; D. C. Davis, lubrication supervisor, AT&SF; M. A. Pinney, engineer of tests, PRR; H. T. Rockwell, assistant engineer, NYC; M. A. Hansen, engineer of research, GM&O; F. Fahland, general mechanical engineer, UP; Robert Schey, general superintendent car department, NYC&StL; L. N. Griffith, assistant mechanical engineer, SP; W. R. Petry, chemist, GN.

Discussion

A cross section of the comments made by four speakers from the floor in the discussion following the presentation of the Lubrication Report was that we still have with us the age-old problem of hot boxes and that the situation is getting "no better fast." The major factor, said one member, in this hot box problem is the rough handling that freight cars get in train yards and that nothing much is being done about it either by mechanical or operating departments. The conclusion of the comments was that one of the principal underlying causes of hot boxes is the failure of the roads to carry out the instructions of the A.A.R. in the matter of packing journal boxes.

(The report was accepted and recommendations referred to letter ballot.)

Couplers and Draft Gears

During the past year a detailed investigation has been made to discover the causes of train partings. A total of more than 900 cars involved in partings were carefully inspected. The reports of these inspections are now being tabulated and studied. It is felt that when this study is completed, evidence will be available to show the prevalence of various kinds of difficulties that are directly responsible for or contribute to train partings. Your committee is giving consideration to the preparation of an instruction bulletin for the use of member roads and private car owners to educate employees in what to look for when train partings occur.

An immediate result of these parting investigations was the discovery that the front lug on the bottom of the link over the uncoupling rod bracket of the Standard Railway Equipment Company's "Safety" uncoupling device could, under certain conditions, hold the rod and locklift toggle in partly raised position. This condition was called to the manufacturer's attention and the design was corrected. The secretary circularized all member roads and private car owners on February 7, 1952, advising of this condition and recommended the removal of the front lug by grinding. A photograph accompanied this circular to clarify the condition.

(The committee here recommended adequate attention to couplers and draft gears whenever cars are on the repair track and not limited to the time of periodic air brake attention which may be 36 months with modern AB equipment. It ruled against flame hardening of draft keys.—Editor.)

Coupler Yokes—Operating Rods

The attention of your committee has been directed to the fact that the current A.A.R. Specification M-205-47 covering design test requirements for coupler yokes does not include yokes designed for use with twin cushion draft gears. Yokes of this type are subjected to both tension and compression loads in service whereas the specifications now cover designs which are subjected only to tension loads. Accordingly, consideration is now being given to appropriate revision of the specifications to include yokes of both

types. Arrangements have been made for conducting additional laboratory tests on all yoke designs of the tension-compression type to establish specification requirements which will insure satisfactory performance of the yokes in service.

During the past year the Waugh Equipment Company, in cooperation with the Mechanical Committee of the Standard Coupler Manufacturers, has developed a design of yoke suitable for use with the Type F interlocking coupler and the Waughmat Twin Cushion draft gear in freight equipment cars. Laboratory tests on yokes of this design in both Grade B and high tensile steel, conducted under the supervision of your committee, have been completed and the results are being evaluated.

Improved Coupler—Operating Rod

An improved type coupler-operating rod, developed by the Standard Railway Equipment Manufacturing Company, was recommended for adoption and subsequently approved by letter ballot as an alternate standard for type E couplers. This style of rod was also approved for use with type F interlocking couplers, but because of the difference in the location of the rotor eye of the locklift assembly used in the F coupler and the increased lateral coupler movement required, the same rod and bracket cannot be used interchangeably with E and F couplers. TheF coupler rod is basically the same but of somewhat different shape and the bracket is considerably longer than that required for the E coupler.

A new drawing, Fig. 1, not included in this abstract of the committee's report, has accordingly been prepared to show the fundamental requirements to be observed when the improved type rod is applied to cars equipped with type F couplers. This new plate will be shown in Sec. C of the manual and identified as standard for type F couplers.

Certified Draft Gears

Miner Type A-22-XL, Waugh-Gould Type 420 and Waughmat Twin Cushion Type WM-4-6 conditionally approved draft gears, having fully met all requirements with respect to laboratory tests and service performance, have been granted unconditional approval and will be so listed in the Interchange Rules.

With respect to Waugh-Gould Type 420, some trouble has been reported with these gears with respect to sticking in service. Investigation developed that an error had been made in one of the tolerances shown on a manufacturer's working drawing and this error made it possible for gears to stick when parts were assembled with the most unfavorable combination of maximum and minimum tolerances. Although this error had been called to the attention of your sub-committee as soon as discovered by the manufacturer and corrective action taken, a limited number of these gears got into service prior to discovery of the error. Since the gears having incorrect tolerances bore no special markings, it was not possible to trace and identify them. The manufacturer has given assurance however that should any of these gears be found sticking in service they will be replaced free of charge.

Hulson Type 202 conditionally approved draft gear.—In making service checks of this gear it was found that the variation in springs was such that the initial spring pressure on the friction shoes was not always sufficient to exert enough wedging force to produce the required capacity. Investigation showed that this fault could be corrected by the insertion of a specially designed shim under these springs. After numerous tests, your Sub-Committee approved this shim for application to existing Type 202 gears when required, the gear then to be known as Type 202 Modified.

For Hulson gears manufactured in the future, a new design of spring will be substituted, making the use of a shim unnecessary. Tests were made with gears having these new springs and were found satisfactory. This new gear will be known as Hulson 202-A and with 202 Modified will be listed in Interchange Rules as conditionally approved gears, superseding Hulson Type 202.

The manufacturer has given assurance that if any Type 202 gears now in service are found to be giving trouble, corrective action to the satisfaction of the car owner will be taken promptly. If such gears are modified by the addition of the approved shims, type marking on gear housings should be restenciled to read: "Type 202 Modified."

National Type MF-260 draft gear has met all of the laboratory test requirements of Tentative Specifications for Rubber Draft Gears for Freight Service and has been granted conditional approval. Application has been filed for approval of National Type MF-275, a variation of the National Type MF-260 gear. Laboratory tests will be made as soon as specimens are available.

Applications are pending for approval of three additional types of short draft gears for new cars of special construction, as follows: Waugh-Gould Type 451, National Type MF-290, National Type MF-290-A. The usual special tests will be made and decision reached as soon as specimens are available.

The last of various special service tests of Waughmat Twin-Cushion draft gears was their application to two brine tank refrigerator cars to determine the effect of brine drippings on the rubber and metal elements. In addition to the specified conditions of service, it was found when the cars were located that one of them had been under water for sometime in the Kansas flood last year. The four gears when removed and tested were found to give practically the same performance as when new. The rubber units were in good condition but the metal plates on the car that had been through the flood were considerably rusted, although not to the extent that the action of the gears was affected.

The report was signed by H. W. Faus, chairman, engineer, locomotive equipment, NYC; C. K. Steins, vice-chairman, mechanical engineer, PRR; F. T. James, general superintendent motive power and equipment, DL&W; B. Faughman, assistant works manager, Angus Shops, CPR; J. W. Hawthorne, general superintendent, motive power and equipment, ACL; I. N. Moseley, research and test engineer, N&W; A. W. Maydahl, engineer car maintenance, UP; A. B. Lawson, mechanical engineer, B&O; N. A. Passur, engineer car construction, SP; V. L. Green, assistant superintendent car department, CMStP&P.

Discussion

In discussion of this report, it was suggested that the allowance of a credit for second-hand draft gears be discontinued inasmuch as no tests or specifications are available to check the quality of railroad work in repairing defective gears. The thought was expressed that defective draft gears, after removal, should be shipped to the owner for disposition if desired, otherwise scrapped.

(The report was accepted and recommendations referred to letter ballot.)

Committee on Wheels

It is recommended, as a letter ballot item, that the tread and flange contour of the 650-lb. chilled iron wheel, design shown on Manual Page G-2A, be changed by having the tread and flange contour agree with that shown on Manual Page G-3 including the ¾ inch radius at outer edge of rim.

Reason: To agree with other approved standard chilled iron wheels.

Experimental Cast Steel Wheels

It was decided to recommend to the General Committee that authority be granted to manufacture and place in service under interchange freight cars up to 1,000 experimental cast steel wheels with carbon content of 1.50 per cent, as manufactured by Southern Wheel Division, American Brake Shoe Company, the wheels to be marked AAR X2; also, that authority be granted to manufacture and place in service under interchange freight cars up to 1,000 experimental cast steel wheels having a carbon content of 0.75 per cent as manufactured by Griffin Wheel Company, these wheels to be marked AAR X3. In addition, the wheel number and date cast shall be marked on each wheel.

The above recommendation was unanimously approved by the

CAST IRON WHEEL FAILURES AS REPORTED TO THE I.C.C.

Year	Total	Flange	Plate	Rim
Average 1946-1950 Incl.	239	165	48	26
1950	222	170	39	13
1951	198*	145	44	9

*—Includes 3 double plate design and 5 SPNB design cast prior to 1938.

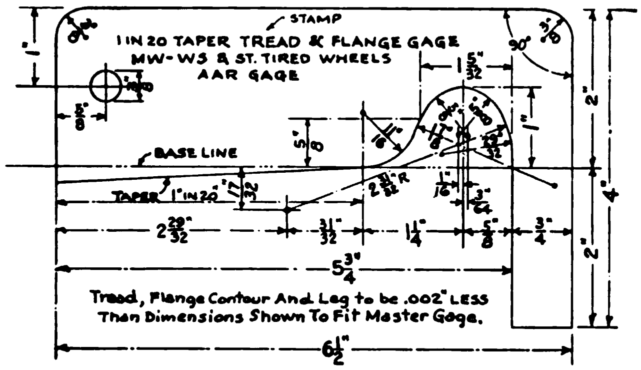


Exhibit B—Gage for determining correct machining of tread and flange contour of M-W wrought steel and steel-tired wheels—A, See Figs. 6 and 6-B. Par. 283.

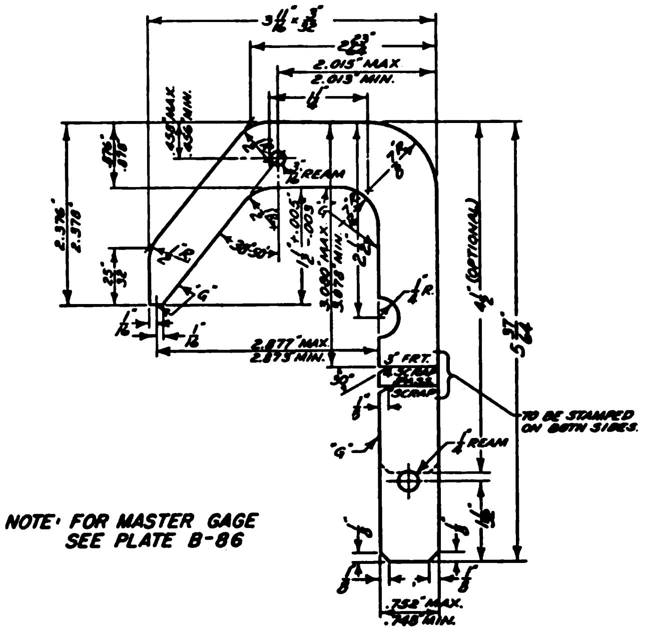


Exhibit E—Condemning gage for 1½" flange height and thin-rim wrought steel wheels.

General Committee and, up to April 1, a summary of wheel service shows some AAR X2 wheels with a maximum of 338,000 miles. Thirty cars have a total of 124 wheels of this type in service and to date have made a total of 1,782,000 miles. Inasmuch as none of these wheels have completed their life an average is not given.

Upon recommendation of your Committee, the Arbitration Committee modified the first note following Sec. (w), Par. (4), Interchange Rule 3 in the 1952 Code to include the word "cast steel" on line 8.

Also, new Par. (c) (8) added to Interchange Rule 98 in the 1952 Code, to read as follows:

"(8) Experimental cast steel wheels marked AARX-2 or AARX-3 when removed from service on account of defect in axle or mate wheel, shall be credited as scrap except when removed on account of Rule 32, 68, or 84 (if wheels are serviceable) condition in which event secondhand credit must be allowed for such undamaged wheel or wheels. All such wheels removed from service for any cause shall be held and disposition requested from car owner. If car owner elects to have wheels returned freight charges collect, shipping instructions must be furnished within thirty days from date of notification. When such wheels are returned to car owner, no credit shall be allowed if the wheels were removed account of owner's defect. If the wheels were removed account of one of the conditions mentioned above, credit to be allowed car owner shall be difference between secondhand and scrap value of cast-steel wheels."

Reason: To provide charges and credits for new design experimental cast-steel wheels, AARX-2 and AARX-3.

(The report here included certain proposed revisions in Specifications M-107 for wrought steel wheels, a suggestion for eliminating chuck marks on this type of wheel, reference to several failures of F-36 design wheels between hub and rim fillets and a requirement that reforged axles, restricted to freight service, be stencilled in letters at least ¼ in. high in locations shown in Fig. 1 of Specification M-101. The committee recommended allowance of a wear limit of ⅛ in. for tubular steel axles and suggested a rule requirement for cleaning and blowing out dirt collected in the hollow portion of the axles due to flood water or other cause. —Editor.)

Gages and Their Uses

Par. 283, Page 183 of the Wheel and Axle Manual, states: "It is advisable to have a template for the correct tread and flange contour which has a leg extending down the back and face of the rim in order to make sure that the total tread contour drop off from the base-line at the throat does not exceed 3/16 in. For tread and flange contours, see Figs. 6 and 6-B." Your committee believes the Wheel and Axle Manuel should illustrate such a template or gage and design as shown in attached Exhibit B. A master gage for checking this gage will be required, as shown in attached Exhibit C (not included in this abstract).

As stated in the 1951 Report of your committee, the standard steel wheel gage, Fig. 122 of the Wheel and Axle Manual, does not condemn high flange at 1½ in., due to the fact that the movable finger when set for high flange, Fig. 128, condemns flange at 1 35/64 in. height.

The design of a standard steel wheel gage to include manufacturing tolerances is shown on Plate B-43 in Sec. B of the Manual. This plate has been modified so that in lieu of using the calibration line between Figs. 6 and 8 on the movable finger when it intersects the top edge of gage (1934 Revision), it will now be effective when the apex of the flange contacts the bottom surface of the horizontal member of the gage. This revised plate is attached as Exhibit D (not included in this abstract of the committee's report).

Attention was directed in the 1951 Report of your Committee to designs of this gage by two member roads for use by car inspectors in coach yards or transportation yards in place of the regular steel wheel gage, Fig. 122 of the Wheel and Axle Manual; the latter gage being more complicated and more expensive.

The matter has been given further consideration and it is recommended, as a letter ballot item, that the design of gage as shown in attached Exhibit E be adopted as Recommended Practice and shown on new Manual Plate B-43-A. It should be understood, of course, that this simplified gage is not intended to replace the standard steel wheel gage, which is necessary for use by forces whose duties require the measurement of service metal in terms of sixteenths of an inch on wrought steel wheels.

Flame Cleaning of Axles

It is recommended, as letter ballot item, that a new third paragraph be added under Rule 221 of the Wheel and Axle Manual to read as follows:

"The best results from magnetic particle testing of axles can be secured when surfaces of axles to be tested are cleaned of rust, oil, paint or dirt adhering to them. In general, these axles can be cleaned by using a rotary wire brush. About ten per cent or less of the axles will have rust, dirt or paint which cannot be removed properly by the rotary wire brush, so it may be considered advisable to flame clean same. In order to properly protect the axle when flame cleaning is used, it must be performed on a machine designed for that purpose and the following is the recommended practice:

(1) Maximum rate of flow of oxygen to burner: 145 cu. ft. per hr. Acetylene: 136 cu. ft. per hr.
(2) Distance of head to work: Surface contact at apex of cone of burner flame.
(3) Minimum rate of head travel: 22 in. per min.
(4) Minimum rotation speed of work: 35 r.p.m.
(5) Design of burner head: 17 orifices of No. 56 drill size in three rows ¼ in. apart with the orifices in each row 9/32 in. apart and staggered.
(6) Flame head must traverse full length of axle between wheel

seats. Automatic cut-off oxygen and acetylene shall be provided in case machine is stopped during flame cleaning process, to avoid the possibility of injury to the surface of the axle.

(7) If necessary to repeat operation, axle must first be allowed to cool to body temperature."

Editorial corrections and other changes recommended by the subcommittees and approved by the Wheel Committee for inclusion in Supplement No. 1 to the current issue of Wheel and Axle Manual appear in Appendix A.

The Committee on Wheels wishes to acknowledge the assistance and cooperation of the Chilled Car Wheel Industry and the Wrought Steel Wheel Industry on subjects handled and discussed with them.

The report was signed by E. E. Chapman (chairman), mechanical assistant, AT&SF; H. H. Haupt (vice-chairman), general superintendent motive power, PRR; I. N. Moseley, research and test engineer, N&W; A. M. Johnsen, engineer of tests, Pullman Co.; M. S. Riegel, assistant engineer of tests, NYC; R. W. Seniff, engineer of tests, B&O; P. V. Garin, engineer of tests, SP; B. C. Gunnell, chief mechanical engineer, Southern; A. M. Guschl, general foreman wheel shop, CMStP&P; A. H. Petersen, superintendent car department, Belt Railway of Chicago.

Discussion

Discussion of the Report on Wheels developed the fact that some failures are giving concern not only to railroads but to the manufacturers. One railroad reported two failures of F-36 wheels in service and a third wheel found cracked which was discovered only after thorough cleaning by sand blasting. The suggestion was advanced that ordinary solvents and cleaners are not entirely satisfactory for cleaning diesel wheels prior to magnetic particle testing. It was maintained that, due to the severity of service conditions under which diesel wheels operate, stress analysis studies should be made with strain gages to determine just what requirements must be met. This is now a prospective A.A.R. research project.

Regarding chilled iron car wheels, it was pointed out that failures have decreased appreciably during the last three years, and apparently will continue to as wheels of older manufacture are taken out of service and replaced by new design chilled wheels. It was reported that 116 of the new cast steel wheels with 1.50 per cent carbon are now in test service and three sets of 20 wheels each, with .75 per cent carbon.

(The report was accepted and recommendations referred to letter ballot).

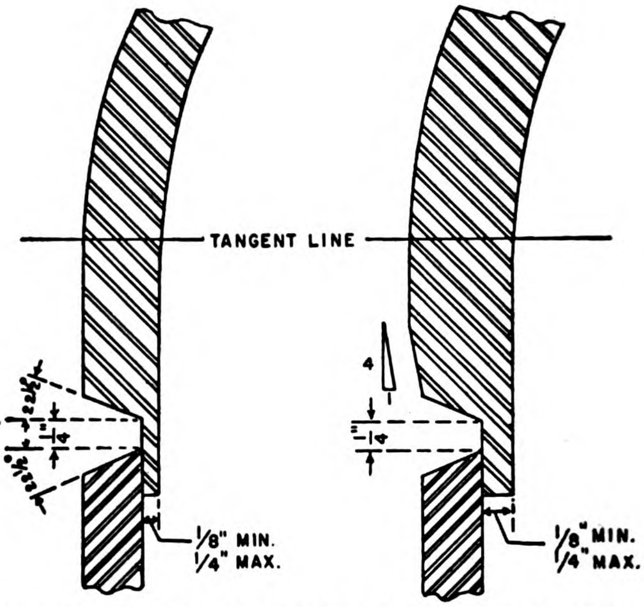
Report of Committee on Tank Cars

During the past year the committee was called upon to give consideration to a total of 405 dockets and applications for approval of designs as follows: 201 covered designs, materials and construction of 7,307 new shipping containers, for mounting on new cars or for replacement on existing cars as shown in the table.

One application covered the construction of six new car structures for the mounting of existing Class ICC-103-W tanks; one covered the construction of one new car structure for the mounting of an existing Class ICC-103A tank; one covered the construction of one new car structure for the mounting of an existing Class ICC-105A300 tank; one covered the construction of 35 tank cars of a proposed ICC-104B-W classification specification; 176 applications covered alterations in, additions to, or conversions and reconditioning of 4,596 existing tank cars or shipping containers.

NUMBER AND CLASSES OF NEW SHIPPING CONTAINERS

Class	No. of Tanks
ICC-103	75
ICC-103-AL-W (Fusion welded seams)	189
ICC-103-W (Fusion welded seams:)	3,141
ICC-103A	1
ICC-103-A-AL-W (Fusion)	2
ICC-103A-W (Fusion welded seams)	485
ICC-103B-W (Fusion welded seams)	95
ICC-103C-W (Fusion welded seams)	3
ICC-104-A-AL-W (Fusion welded seams)	10
ICC-104-W (Fusion welded seams)	357
ICC-104A-W (Fusion welded seams)	2
ICC-105A300-W (Fusion welded seams)	1,416
ICC-105A400-W (Fusion welded seams)	400
ICC-105A500-W (Fusion welded seams)	68
ICC-106A500-X (Fusion welded longitudinal shell seams)	1,053
AAR-201A35-W (Fusion welded seams)	10
Total	7,307



Optional welding for head-shell Joints when inside diameter is not over 36 in.

The proposed alterations, conversions, additions or reconditioning operations, affecting the foregoing 4,596 cars or shipping containers, consisted of such items as: Air connections installed; bolster saddles renewed; bottom washout arrangement installed; conversion from ARA-III to insulated ARA-III; dome platform and ladder applied; heater systems installed; manway cover fittings altered; Q-187 Saran rubber lining applied.

Upon recommendation of the committee, concurred in by the Bureau of Explosives, the General Committee approved amendments to AAR paragraphs requirements of specifications Class ICC-103-W, ICC-103A-W, ICC-103B-W and ICC-104-W, with respect to non-destructive test of fusion welded seams.

New Specifications

During the year the committee concluded consideration of proposed specifications Class ICC-103AL-W and ICC-103A-AL-W covering tank cars with fusion-welded aluminum tanks and used for the transportation of flammable liquids or corrosive liquids. The specifications appear as Exhibits A and B (not included in this abstract of the committee report.—Editor.)

During the year, the committee also concluded consideration of proposed spec. Class ICC-110A500-W covering tank cars having metallic-arc fusion-welded tanks and used for the transportation of dichlorodifluoromethane; also spec. Class AAR-205A300-W covering tank cars having fusion-welded steel tanks and largely used for the transportation of nitrogen fertilizer solution. These specifications, presented as Exhibits C and D, are also omitted here.

At meeting held on January 30 and 31, 1952, the Committee on Tank Cars considered and progressed or disposed of 40 special subject items previously docketed.

The report was signed by J. E. Keegan (chairman), chief car inspector, PRR; J. R. Hayden (vice-chairman), superintendent car department, MKT; R. S. Venning, special engineer, C&O; F. J. Harris, mechanical engineer (car), CN; N. A. Passur, engineer car construction, SP; W. Combs, general car foreman, T&P; J. B. Ferrell, general car foreman, TP-MP Terminal R.R. of New Orleans; R. M. Smith, vice-president, Union Tank Car Co.; R. T. Baldwin, secretary, Chlorine Institute; T. H. Caldwell, maintenance superintendent, Dow Chemical Co.; R. W. Thomas, vice-president, research and development, Phillips Petroleum Co.; R. H. Ewing, master car builder, Cities Service Oil Co.

(The report was accepted.)

Specifications for Materials

The committee recommended that changes in the following specifications be submitted to letter ballot:

M-101 (carbon steel axles, non-heat-treated) to discontinue marking this design of axle on the black collar.

M-107 (multiple-wear wrought carbon steel wheels) to modify the specifications.

M-111 (pipe for special purposes) to revise numerous sections of the specifications.

M-115 (boiler and firebox steel) to change the composition.

M-116 (structural steel shapes) to eliminate check analysis for bar-size shapes under ½-in. thickness.

M-125 (machine bolts and nuts) to conform to the new Unified Thread System.

M-126 (carbon steel forgings) to make section 9 conform to commercial practice and to increase the carbon content of Grade F forgings.

M-127 (alloy steel forgings) to make section 9 conform to commercial practice.

M-130 (pipe for ordinary use) to be consistent with commercial practices.

M-201 (steel castings) to modify the carbon content and the hardenability of Grade C steel, and the welding procedure on grades C, D and E castings.

M-501 (lined journal bearings) to change the zinc content.

M-601 (air brake and train signal hose) to permit the use of a 1-in. section cut from the end of the hose for the cold test.

In addition, the specifications for blooms, billets and slabs for forgings (M-105) is being split into two sections, one for carbon and the other for alloy steel billets. Editorial changes were made in M-107, M-403 and M-602.

Emergency specifications were adopted for the following:

M-106 (car and locomotive tires) and M-124 (heat-treated tires) to increase the sulfur and phosphorous limitations for acid steel.

EM-911 (bristle, hair fiber and wire brushes) and EM-915 (nylon filament brushes) to comply with National Production Authority Order M-18.

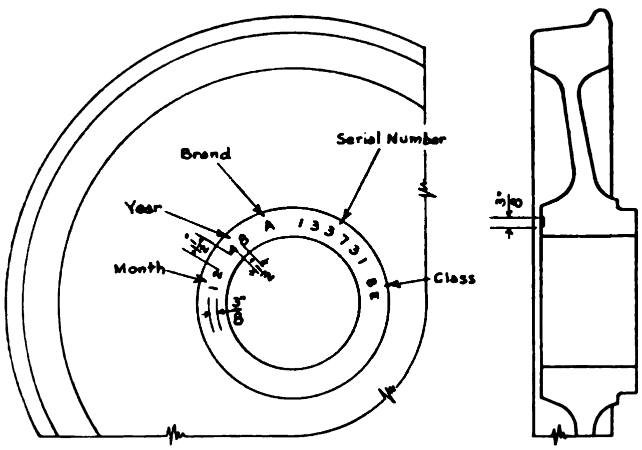
The report described the progress to date in setting up a small research group to work with various A.A.R. committees, diesel locomotive builders and oil companies to investigate diesel fuels and lubricants.

Motion pictures of tests using cut back journal oil as a swabbing oil indicated that some benefit resulted from swabbing the journals at the —15 deg. temperature range. The committee, however, was not in favor of issuing proposed specifications for journal swabbing oil without more evidence, and they further believed that the writing of such a specification should be held in abeyance pending consideration of specifications for new journal box oil.

A joint subcommittee was formed from members of this committee, the lubrication committee, and members of the A.A.R. mechanical engineer's office to outline action to be taken with respect to the hot box situation. Among the items under consideration is a proposed specification to supersede EM-906-60, New Journal Box Oil (all-year grade) and the same requirements to be established in lieu of EM-905-50, Renovated Journal Box Oil.

Members of the committee are: W. F. Collins (chairman), engineer of tests, NYC; P. H. Smith (vice-chairman), engineer of tests, CB&Q; H. G. Burnham, engineer of tests, NP; M. A. Pinney, engineer of tests, PRR; M. C. Haber, research and standards engineer, UP; R. W. Seniff, engineer of tests, B&O; E. B. Fields, engineer of tests, AT&SF; R. McBrian, engineer standards and research, D&RGW; L. S. Crane, engineer of tests, Southern; G. E. Baumgardner, assistant research engineer, N&W; V. C. Barth, chief chemist, C&NW; and P. V. Garin, engineer of tests, SP.

(The report was accepted and recommendations referred to letter ballot.)



Notes:
1. CHARACTERS TO BE COLD STAMPED ON FRONT FACE OF HUB AS SHOWN. NUMBER OF CHARACTERS MUST NOT EXCEED 13.
2. BRAND LIMITED TO ONE INITIAL, TO BE AS FOLLOWS:— A-ARMCO, B-BETHLEHEM, C-CARNEGIE (PITTSBURGH PLANT) E-EDGEWATER, G-ILLINOIS (GARY PLANT), S-STANDARD.
3. STAMPINGS TO BE SPACED APPROXIMATELY ½ IN. BETWEEN CHARACTERS AND APPROXIMATELY 1½ IN. BETWEEN GROUPS AND LOCATED APPROXIMATELY CENTRAL OF THE HUB FACE.
4. STEEL STENCILS USED TO PRODUCE CHARACTERS SHALL BE NOT LESS THAN ⅜ IN. IN HEIGHT.
5. SINCE THE LARGE MAJORITY OF WHEELS ARE RIM TREATED, THE LETTER "R" USED IN DESIGNATING SUCH WHEELS SHALL BE ELIMINATED; BUT DESIGNATION "E" MUST BE USED FOR ENTIRE QUENCHED WHEELS.

Alternate marking of deisel locomotive wrought-steel-wheel designs HO33, F-36, A-40, C-42, BX-38 and AX-40.

Safety Appliances

During the year the committee considered a total of 95 applications covering 108 designs for the approval of safety-appliance details for use in the construction, alteration, or conversion of tank cars.

During the year three new designs of metal running boards were investigated, tested and approved by the committee: Irving Subway Grating Company's gratings R-BC and R-TC, and Trousco Type C "Riveton." Following tests of the modification of the Blaw-Knox Electroforged Type SJ-16 running board, it was approved. One other new metal running board design is now under consideration.

Representatives of the Safety Appliance Committee and the Committee on Brakes and Brake Equipment have prepared proposed revisions of a number of rules in the publication entitled "Maintenance of Air Brakes and Air Signal Equipment on Locomotives and Cars," and several conferences have been held with representatives of the Interstate Commerce Commission. Difficulty is being experienced in approving one rule in such form as to satisfy all interests involved.

Variable Load Brake Service

It is the practice of the Safety Appliance Committee to review the detail reports which are prepared from time to time by the Committee on Brakes and Brake Equipment covering periodical inspection and tests of cars in the lot of 398 lightweight hopper cars owned by the Illinois Central which are equipped with ABLC brakes.

The members of the committee are R. G. Henley (chairman), general superintendent motive power, N&W; H. T. Cover, assistant vice-president (oper.) and chief motive power, Pennsylvania; B. M. Brown, general superintendent motive power, SP; F. K. Mitchell, manager equipment, NYC system; J. M. Nicholson, mechanical and research engineer, AT&SF; A. K. Galloway, general superintendent motive power and equipment, B&O.

(The report was accepted.)

Labor and Material Prices

The committee has continued the work of analyzing material, labor and new equipment costs in A. A. R. Interchange Rules 101, 107, 11, and 112 of the Freight Car Code, and Rules 21 and 22 of the Passenger Car Code, with a view of determining and recommending necessary changes to be made in the next supplement to the current code.

RULE 101: All miscellaneous material prices in Rule 101 were

rechecked as of March 1, 1952, quotations submitted by the purchasing agents of the ten selected railroads, representing thirty-nine percent of total freight car ownership, showing a mixed trend in material markets as indicated by detail recommendations for revisions shown under this rule.

Note following Item 101-B eliminated to permit application of Wabcoseal fittings to cars under all conditions.

Item 105-A modified to provide price for malleable iron, A.A.R.-1947 Standard, 6½" x 12" journal box lid.

Item 105-C modified to provide price for composite malleable iron and pressed steel, A.A.R. 1947 Standard, 6½" x 12" journal box lid.

Item 145 modified to indicate that charge is intended to cover steel doors for box and automobile cars and not to refrigerator or stock cars.

Fourth note following Item 169-I modified to limit charge where all packing retainer devices are R. & R. or R.

Based on results of a joint study made by a special subcommittee composed of members of the committee on prices for labor and materials and the committee on couplers and draft gears, present note preceding table of draft gear prices in Rule 101 modified to provide average credits for approved and non-approved types of friction draft gears on the basis of separate arbitrary allowances for each class, regardless of the extent of the defective condition of gears removed.

As recommended by the committee on couplers and draft gears, the following modifications made in Sections I and II of the Friction Draft Gears:

Item 250-C modified to show Hulson 202 Modified and 202-A (both conditionally approved) in place of Hulson 202 which has been transferred to Section II as new Item 252-B.

Items 250-E1 and 250-J modified by elimination of words "conditionally approved." (Miner A-22-XL and Waugh-Gould 420, respectively.)

Note 3 modified by elimination of words "conditionally approved." (Waughmat Twin Cushion WM-4-6.)

New Note 5 added to provide for National Rubber Cushion Type MF-260 draft gears.

Items 251-D, 253-G and 253-J modified to include additional types of non-approved draft gears. (Cardwell L-11-S, Miner A-69-XD and A-100-X, respectively.)

Rule 111: Item 10 modified to indicate charge also applies to release control retainer cleaned and tested. Item 28 modified to show piece numbers of the service and emergency portion gaskets.

Rule 112: Recommendations were made in this rule respecting reproduction pound prices of new freight cars of all classes, in order that Supplement of August 1, 1952, may reflect 1951 costs in lieu of figures shown in the present Code. Recommendation was also made in this rule to incorporate new per pound prices in Paragraph 8 of Section B for Classes 103-W, 103-AW and 203-W, noninsulated and Classes 103-W, 103-AW and 104-W insulated tank cars. The new prices recommended for all classes of cars are based on 63,322 freight cars constructed during the year 1951.

Time studies are to be made by a Special Subcommittee covering periodic attention to D-22 type air brake equipment. When time studies are completed, and if results justify modification of existing allowances or the addition of new items, such changes or additions will be made.

On page 4 of he report of the committee on prices for labor and materials for 1951, it was stated that in view of the possibility under present labor contract arrangements of there being four changes in the price rules each year account fluctuation in cost of living allowances, plus the regular scheduled issuance of Supplements, it was felt that the Arbitration Committee should review this matter from a policy viewpoint and determine what should be done to cope with this subject with the least amount of confusion.

Upon instructions from the arbitration committee, the committee on prices for labor and materials added 25 items to the former list of 13 key items, at meeting held on October 25 and 26, thereby making a total of 38 major items, including either labor or a combination of labor and material, to be changed the first of the month following, whenever there is a net increase or decrease of at least $0.05 per hour in the A.A.R. freight car labor rate due to the escalator clause or general increase or decrease in wages paid to men engaged in car repairs.

The arbitration committee also decided that no printed Supplements other than the regular Aug. 1 Supplement to the Interchange Rules will be issued hereafter to cover all combination items in the Price Rules and that all combination items other than the 38 major items mentioned above will be changed only in the regular Aug. 1 Supplement or in the regular annual revision of the Code, the same dates on which material prices are changed.

It is the intent of the committee to investigate labor and material costs again in October and if sufficient change develops, necessary revisions will be made and inserted in the Rules, effective January 1, 1953.

The members of this committee are: T. J. Boring (chairman), general foreman, M. C. B. Clearing House, PRR; P. F. Spangler (vice-chairman), superintendent car department, StL-SF; C. A. Taylor, assistant to superintendent car department, CRI&P; L. B. George, assistant chief motive power and rolling stock, CPR; G. A. Mundt, supervisor of A.A.R. Billing Bureau, NYC; R. M. Smith, vice-president, Union Tank Car Company; A. W. Hinricks, assistant to vice-president, North American Car Corporation; and L. R. Schierbecker, assistant superintendent car department, IC.

(The report was accepted.)

Report on Hot Box Alarms

During the past year no meetings of the Committee were held. All road tests of hot box alarm systems or devices which have been approved by the Committee for service demonstration have been completed and were published in the Committee report last year. During the past year there have been no devices submitted for test.

Mention was made in the 1951 Annual Report of a device for detecting overheated journals by employment of a bolometer, or electronic radiation type of detector. The inventor of the device was requested to submit a working model for test but no further communication has been received from the inventor.

Service Experience

Twin Plex Alarm' *(Solid and Roller Bearings)*.—A summary report covering the experience of the New York Central System during the period March 1, 1951, to March 1, 1952, with the Twin Plex Alarm and is as follows:

The report shows that detections of overheated bearings were made by this device on steam and diesel locomotives and passenger equipment cars. Of the 64 cases included in this report the largest number, 54, were indicated by odor with 7 being indicated by smoke and 3 being indicated by both smoke and odor. In most of the cases reported, detection of the functioning of this alarm was made by the train and engine employees on the train involved; however, others were detected by towermen, station employees, section men, yardmen and crew members of passing trains.

Fenwal "Journ-A-Larm" System (Roller Bearings): Reference to the applications of the Fenwal "Journ-A-Larm" system to a group of new passenger cars built for the Southern Pacific Company was covered in the 1949, 1950 and 1951 Annual Reports; the following information was made available by L. H. Sultan, a member of the Committee:

"This device was continued in operation during the past year and performed satisfactorily. False indications were obtained from time to time for various reasons. The majority of false alarms were caused by:

a. Defective control switches on the alarm control.
b. Defective operation of timers operating the solenoid alarm valves.
c. Internal breaking of leads inside the head of the Thermoswitch.

There were no cases of hot roller bearing journals on Southern Pacific passenger cars during the period from April 1, 1951, to April 1, 1952.

The manufacturer continued a development program for the purpose of providing a basically new system for detection of overheated roller bearing journals. The changes are principally in the alarm panel located in the car electric locker and the

thermoswitches. The car journal alarm wiring remains practically unchanged. The circuit arrangement for the new system is a normally open circuit with an automatic checking feature. Several car sets of the improved equipment were received from the manufacturer in May, 1952, and will be applied to cars in the near future. By the end of this year, it is expected that approximately ten cars will be so equipped and results of service tests should be available for the next annual report."

(The report included a detailed tabulation of reports of hot bearings detected on the New York Central—Editor.)

Discussion

The general trend of the discussion of hot box alarms centered around the matter of false indications which seem to be the result of open circuits due to failures in the wiring on the car trucks or in the Thermoswitch. Continued study is being given to the troublesome characteristics of some of the existing types of hot journal alarms with a view to remedying them. One speaker described a new design of hot box alarm which embraces improvements that eliminate some of the faults of existing designs and while it has been in service only a short time it gives indication of the possibility of making a substantial reduction in the number of false indications.

The report was prepared by a committee of which W. M. Keller, director of mechanical research, A.A.R. Mechanical Division, was chairman.

(The report was accepted.)

Loading Rules

The modernization of the Open Top Loading Rules at the request of shippers was completed with the publication of Pamphlet MD-6. This sectionalizing of the rules, requiring a review of all loading figures and the preparation of six individual pamphlets, now supersedes the Loading Rules Book issued June 15, 1947 and Supplement No. 2 thereto, and the Special Supplement covering Grading and Road Making Machinery issued on Feb. 1, 1950. The present open Top Loading Rules are now contained in the following publications:

MD-1—Steel Products, issued Sep. 1, 1950.

MD-2—Machinery, issued Feb. 1, 1951.

MD-3—Forest Products, issued June 1, 1951.

MD-4—Pipe, issued June 15, 1951.

MD-5—Miscellaneous Commodities, issued July 1, 1951.

MD-6—Road Grading, Road Making and Farm Equipment Machinery, issued Mar. 1, 1952.

Special Supplement No. 1—Department of Defense Material, issued Oct. 1, 1950.

Special Supplement No. 2—Department of Defense Material, issued Jan., 1951.

Several joint meetings were held with the Farm Equipment Institute, at which time twenty new loading figures covering combines, corn pickers, hay balers, etc., were agreed on and specifications and drawings formulated and included in the preparation of Pamphlet MD-6. The balance of the figures in the Loading Rules Book, covering tractors and farm equipment machinery, were also reviewed and revised, and together with the new figures above, comprise Part 2 of the pamphlet, with Part 1 made up of the grading and road making machinery loading figures. The agreed-on revision in the tractor figures has greatly reduced the number of cars shopped for adjustment of lading, there being no cases reported of tractors falling off enroute or of having caused a serious accident.

The educational program set up last year by the Department of Defense in conjunction with the A.A.R. is being continued. The material presented at these seminars, including the visual aids, has now been prepared and is being used by the Department of Defense for the purpose of instructions in proper loading methods at all military depots or installations.

The possible revision of Special Supplements 1 and 2 has been brought to the committee's attention at a recent joint meeting with the Department of Defense. It was pointed out loading methods should be formulated and included in these rules for other items of material or machines which are shipped in volume, and not at present covered by specific loading figures. Several joint meetings have been held during the past year to progress the preparation of new loading methods and to consider recommendations for changes or revisions in the present loading figures. Specifications and drawings for six new loading methods covering cranes, semi-trailers, etc., have been formulated and the necessity of including loading figures for other essential items is being studied jointly with the Department of Defense. A number of inspections and shock tests have been held on proposed methods of loading trucks, trailers, jet engine containers, artillery units and tanks.

One joint meeting was held with the American Iron and Steel Institute, at which time recommended changes in the pipe loading figures and specifications were approved for inclusion in the Steel Pamphlet, MD-1. Three new loading figures, covering alternate methods of loading wire mesh, were formulated following inspection and shock tests of specimen loads and on conclusion of successful experimental test shipments. Other inspections have been held resulting in the preparation of new figures to cover the loading of cranes, clay pouring channels, and clay sewer pipe; these will be included in the next revision or printing of Pamphlet MD-5.

The report was divided into two sections, one covering all completed items scheduled for inclusion in the rules, the second covering subjects still under consideration.

The first group of items concerned revisions to section (A), rules 8 and 15, table 32, and Figs. 22, 71-A, 74-A and 77-A of MD-1; note 2—skids, section (a) of MD-2; rules 8 and 15, and Figs. 5-12, 14, 18-25, and 28-34 of MD-4; rules 8, 15 and 19-B, table 32, and Figs. 8A, 11, 22-31, 33-35, 68, 77 and 78 of MD-5; and rule 15 of MD-6.

The second group, contained 21 subjects still under consideration, some of which require only revisions in the present specifications and figures, while others require the formulation of new specifications and figures to cover. The subjects comprise ten on steel products (coils; plates; sheets; slabs; roofing or siding panels; tanks; pipe), one on farm machinery (hay balers), two on miscellaneous commodities (plate glass; boxed auto parts), and eight on Department of Defense Materiel (tanks; guns; trailers; engine containers; trucks).

The Department of Defense Subcommittee is considering the revision of all tank loading figures to show weight limits in lieu of the present wording, and revision of other methods covering items such as guns, trailers, trucks, etc.

Progress has been reported by the subcommittees on the loading methods under consideration with eleven inspections having been made at the shippers' plants. Several of these inspections have resulted in authorizing experimental shipments, which are still being carried out and the balance are in various stages of completion and inclusion in the published rules.

The members of the Loading Rules Committee are: W. B. Moir (chairman), chief car inspector, PRR; H. H. Golden (vice-president), supervisor A.A.R. interchange & accounting, L&N; T. W. Carr, assistant to superintendent of equipment, P&LE; G. D. Minter, district car inspector, N&W; A. H. Keys, superintendent car department, B&O; H. S. Keppelman, superintendent car department, Reading; L. F. Delventhal, Jr., transportation inspector, WP; H. J. Oliver, assistant superintendent motive power, DT&I; F. A. Shoulty, assistant superintendent car department, CMStP&P; H. L. Hewing, superintendent interchange, Chicago Car Interchange Bureau; N. A. Williams, general car inspector, UP; H. G. Neale, assistant chief draftsman, CNR; and J. H. Campbell, supervisor of loading, Mechanical Division, A.A.R.

Discussion

The discussion stressed the importance of proper loading from the standpoint of the shipper as well as of the railroads. The tendency of the shipper to economize on labor and material in securing loads may cause serious hazards and delay deliveries. When the shipper is made to realize this he is less critical of the railroad.

(The report was accepted.)

Forest Products Loading

A canvass of roads made by the committee showed that there was a notable increase during the latter part of 1951 in the num-

ber of shipments on which the lading shifted to the extent that it caused trouble. A review of the reports received indicated that a large number loads were shifting due to the shippers loading long material on top of short material. Further, the loss of surfaced material from open top cars was partly caused by some shippers placing short pieces in the center of tiers. These short pieces invariably work out of the core of the tier and work their way off sidewise and endwise, frequently causing damage to signal and switch equipment. Another contributing factor was the fact that in various parts of the country the shippers were not complying with the rules, using insufficient stakes, undersize stakes, insufficient ties, improper separators, incomplete top layers not properly secured, loose loading, and improper segregation as to lengths.

The railroads were to a great extent responsible for the poor loading as such loads should be rejected when offered for shipment. It has been the experience of the committee that in nearly every case the shippers are as much interested in safe and expedient movement of their products as the railroads and welcome any information from the carriers pertaining to delays to their shipments due to their failure to properly load and secure the lumber before offering the cars for shipment.

The committee prepared proposed modifications of the present requirements of Figures 6, 7 and 9, of Pamphlet MD-3, which cover the loading of lumber on single cars. These proposals were submitted to the shippers for review and comments, prior to a joint meeting with the representatives of the various lumber associations, at Portland, Ore. The recommendations were reviewed in detail and an agreement reached on all points at issue. Revised specifications containing all agreed-on changes, additions or deletions were a part of the report.

Included in the revised specifications were provisions for an alternate design of center blocking between side by side piles to reduce the amount of material now being used for this purpose. Revised drawings for all three of the loading figures, namely 6, 7 and 9, will be issued to all concerned in the near future.

The possible revision of Figures 16 to 27 of Pamphlet MD-3 has been progressed to the point where they will shortly be forwarded to all of the various Associations of Pole Shippers for review and comments, with the request that a Joint Meeting be held in September of this year for the purpose of reaching an agreement on all revisions necessary, after which revised specifications and drawings will be issued to all concerned.

The proposed revision of the figures involved is a change from the present specifications, in that letter symbols for similar items in each figure will be the same, for example, A for brake wheel clearance, B for side stakes, etc.

The loading of unpeeled pulpwood, crosswise and full width of car, is not at the present time covered in the rules although it is a troublesome load. The committee is requesting all member railroads to submit an adjustment report covering each load of unpeeled pulpwood shopped for adjustment during the period from June 1 to Aug. 31, 1952. When these reports are received they will be reviewed and tabulated, and if sufficient information is available to warrant it, a joint meeting will be held with the pulpwood shippers, in an effort to convince them that side protection is necessary on unpeeled as well as peeled pulpwood.

The members of this committee, in addition to the personnel of the Loading Rules Committee, are: F. G. Moody (chairman), superintendent car department, NP; J. E. Rose, general inspector, A.A.R. Interchange Regulations, CPR; G. J. Lehnerer, superintendent car department, IC; J. F. Likarish, master car builder, GN; and C. C. Leriche, supervisor car construction, SP. F. A. Shoulty, assistant superintendent car department, Milwaukee Road, is chairman.

Discussion

The discussion stressed the importance of the railroads working closely with lumber shippers so they will understand the need for living up to the rules. One difficulty in the way of getting tight loads is the variation in the width of open-top cars, varying all the way from 7 ft. 6 in. to 10 ft. A representative of the California Public Utilities Commission told how the railroads, lumber shippers and that commission work together to bring about safer loading of forest products. He stressed the necessity of load inspectors educating the men who assemble the lumber in units before they reach the car. These men, he said, though usually the last men hired, determine whether cars will be properly loaded.

(The report was accepted.)

The opening session of the twenty-sixth annual meeting of the Mechanical Division in the Terrace Room of the Fairmont Hotel, San Francisco, on June 24

ELECTRICAL SECTION

Throttle Control of Tractive Force

How this means of limiting motor current works and what it means in diesel-electric locomotive operation

"Throttle control of tractive force" is the name coined to describe the control system currently used on Alco-G.E. diesel-electric road locomotives

By J. R. Westerheide

Locomotive & Car Equipment Department
General Electric Company
Erie, Pa.

THE first step in developing the control system currently used on Alco-G.E. diesel-electric road locomotives was to determine the features desired in a modern control scheme. Prominent among the items listed was some means for rapid, positive control of tractive force in steps suitable for good starting and handling trains, even under adverse conditions. The control system now in use, was designed to include such a method and the name "throttle control of tractive force" coined to describe it.

Limitations of Standard Control

Standard practice by most builders over a number of years has established the use of eight throttle handle notches on diesel-electric road locomotives. A governor maintains a predetermined diesel engine speed for each throttle position. On Alco-G.E. locomotives, this speed ranges from a minimum of 350 r.p.m. in the first notch, to a maximum of 1,000 r.p.m. in the eighth notch.

The maximum power output in each throttle position is controlled and held constant by a load-control feature incorporated in the engine governor. This control regulates the load demand of the main generator on the diesel engine. The limit is set at the horsepower, that the engine

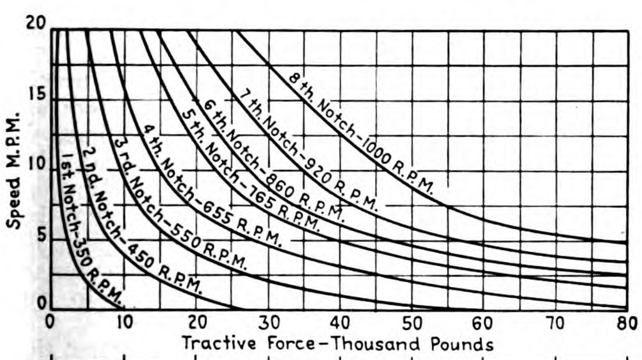


Fig. 1—Hypothetical speed-tractive-force curves of a 1,600-hp. freight locomotive with 65-m.p.h. gearing, not equiped with throttle control of tractive force

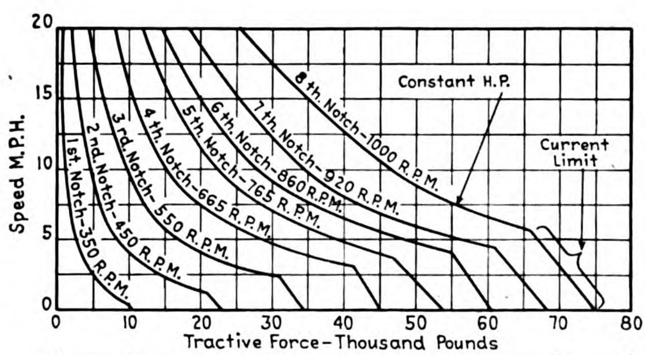


Fig. 2—Speed-tractive-force curves of same locomotive as Fig. 1, equipped with throttle control of tractive force, showing effect of current limit

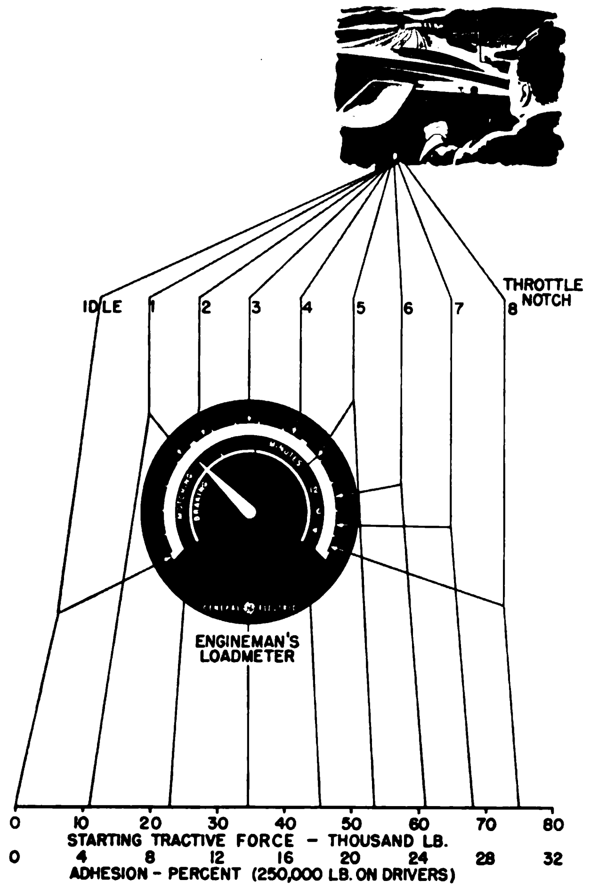


Fig. 3—Relationship between throttle notch, motor current and tractive effort for the locomotive of Fig. 2

can produce at that speed, without appreciable drop in speed. Fig. 1 gives hypothetical constant-horsepower speed-tractive-force curves for the eight throttle notches of a 1,600-hp. road locomotive with 65-m.p.h. gearing. These are plotted up to a speed of 20 m.p.h. From the figure, it can be seen that the tractive force increments, when starting a train, would normally be very large while the throttle is being notched up. This indicates the need for another form of control to limit the increments to suitable values and permit using all the throttle notches, if necessary, to start the train.

In the majority of cases, it is possible to start a train with the conventional control. However, this does not lend itself well to smooth train handling, nor does it provide any protection against excessive overload current on the traction motors and generators. The tractive force control feature was incorporated on the Alco-G.E. road locomotives to overcome these weaknesses.

Principles of the New Scheme

To control the tractive force of a locomotive, it is only necessary to regulate the motor current. This is true because motor current is an invariable measure of tractive force. The Alco-G.E. control system employs saturable core reactors to measure the current flowing to the traction motors. This current is then controlled by limiting the generator output to a definite value for each throttle position. The effect of this current limit on each throttle notch curve is shown in Fig. 2. It causes the tractive force to follow the straight line starting at 0 m.p.h. and ending at the point where the selected horsepower is being delivered for that particular throttle position. As a result, the starting tractive force of the locomotive is divided into eight convenient steps corresponding to the eight throttle notches. This compares with approximately four steps available when the current limit feature is not used. Furthermore, using this scheme, the predetermined starting tractive force is available immediately after the engineman advances the throttle to a new position.

Fig. 3 gives a visual concept of the relationship between starting tractive force, load meter current and throttle position. It is based on a typical 1,600-hp. road locomotive with current limit control.

Simplicity of Handling

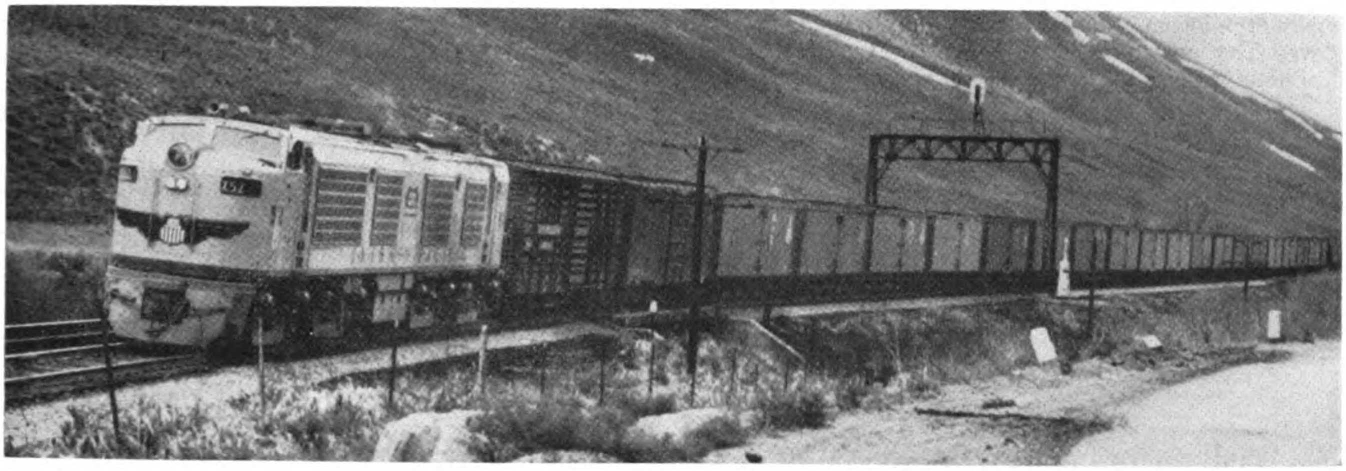
A locomotive equipped with this control requires slightly different throttle handling than one not so equipped. In order to derive maximum benefit from this system, the engineman must understand its proper use. He must realize that he has to advance the throttle all the way to the eighth notch in order to develop full tractive force. Since the maximum current is controlled, this can be done without electrical or mechanical damage to the equipment. The ability to thus open the throttle wide at start is highly desirable. In fact, it is necessary under certain conditions. To permit heavy current to pass through a stalled traction motor for any appreciable length of time is the worst treatment it can receive. Moreover, operation of the diesel engine at the higher throttle notches with light load for any appreciable time is undesirable. Therefore, the locomotive should be started as quickly as possible and accelerated to a speed that will bring the load meter into the continuous rated zone in the minimum time. Throttle control of tractive force enables the engineman to do both of these things.

Operating Advantages

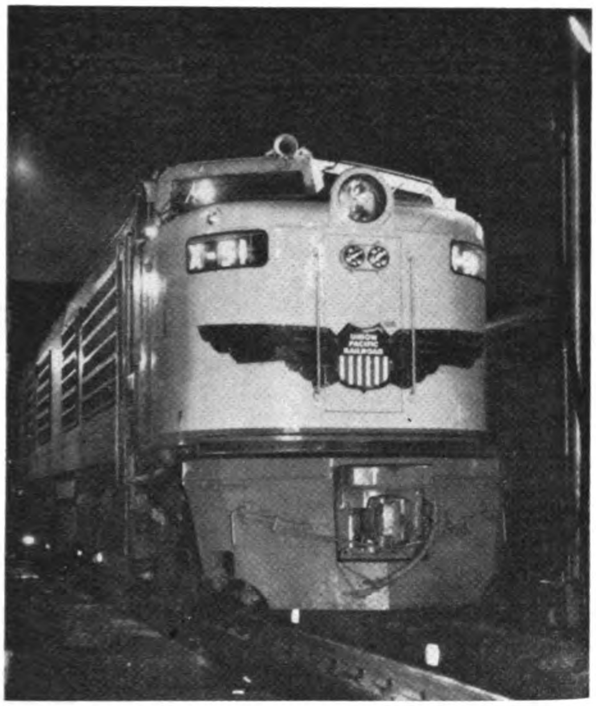
This control feature has proved to be a valuable tool for improved train handling. The engineman has a fast, positive control of tractive force that is there when he calls for it. The fact that all eight throttle notches may be used in starting gives smaller tractive force increments. As a result, many trains may be started without taking slack and running the risk of pulling drawbars. Also trains may be started on adverse grades which might otherwise require doubling the hill. This was demonstrated during a recent test of a 4-unit, 6,400-hp. road freight locomotive. The locomotive was stopped on a 2.4 per cent grade with a rated load for that grade of 2,399 actual tons. By taking slack, and through proper application of tractive force. the train was started easily with the throttle in the sixth notch and an approximate load meter reading of 1.200 amp. (12 minutes on the time scale).

Another important advantage of this controlled tractive force feature is protection of the traction motors and generators from excessive current. The system limits the current to a safe value in all throttle positions when starting a train. The engineman need not fear damaging the electric equipment unless he exceeds the short-time capacity of the traction motors by operating in the limited zone of the load meter for too long a time, or unless he permits heavy currents to continue to pass through the motors at standstill.

Throttle control of tractive force is a refinement that still further increases the ability of the diesel-electric locomotive to get tonnage over the road. This is especially significant just now, when increasing traffic and curtailed production of new motive power require working every locomotive at maximum efficiency.



Locomotive No. 52 on the 1.14 per cent grade between Ogden, Utah and Wahsatch, Utah



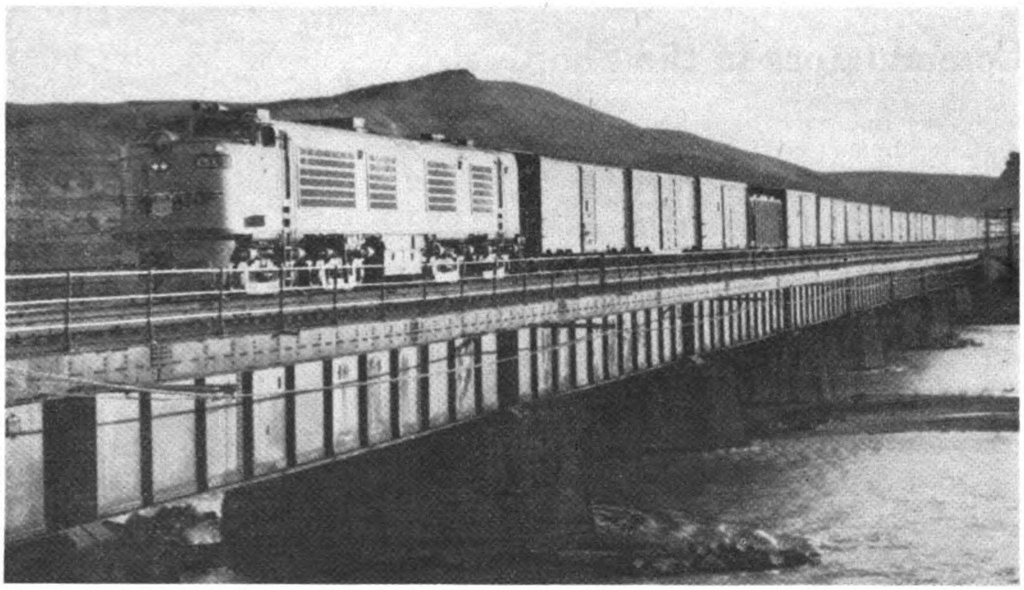
Union Pacific's Gas Turbines Now in Regular Service

Gas turbine-electric locomotives are now operating on the Union Pacific between Green River, Wyoming, and Ogden, Utah, a distance of 175 miles. Locomotives Nos. 51, 52 and 53 are in regular pool service.

Westbound, with a ruling grade of .82 per cent, a locomotive hauls trains of 5,000 tons. Eastbound, with a helper, from Ogden, Utah to Wahsatch, Utah, with a ruling grade of 1.14 per cent, the tonnage is 4,800 to 5,000. Eastbound, without a helper, the locomotives will handle 3,800 tons. The weight of each locomotive is about 554,000 lb., and they are conservatively rated at 4,870 hp.

The average time for the round trip, including yard movements, servicing and inspection, is 16 hours. Nor-

Above: Locomotive No. 51 on the service tracks at Green River, Wyoming

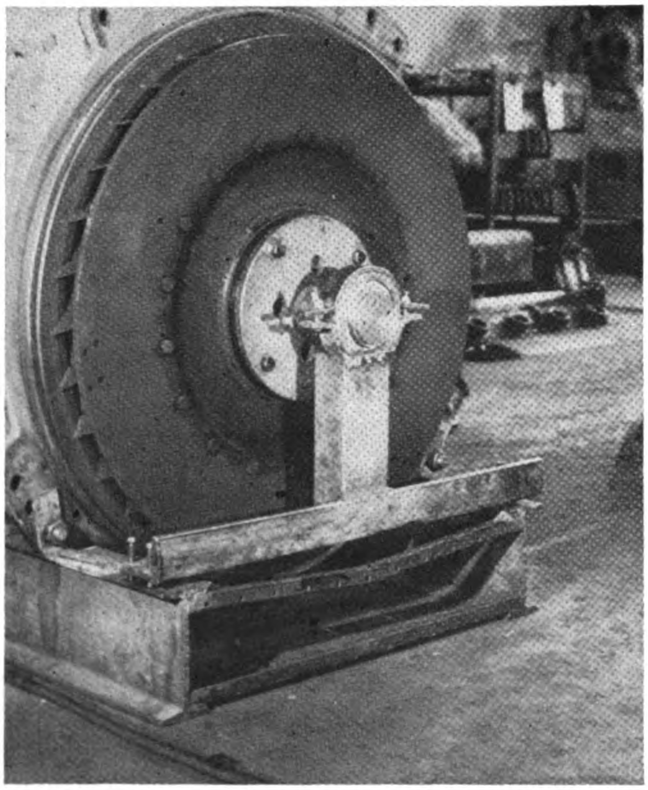


Right: A gas-turbine-electric locomotive brings a train over the Green River, Wyoming

mally each locomotive makes three round trips every two days. The locomotives use Bunker "C" type fuel which has been processed to remove harmful elements.

There have been only two locomotive failures attributable to locomotive equipment since the first unit, No. 51, went into service January 31, 1952. The second unit, No. 52, was placed in service April 9, 1952. The third unit, No. 53, was placed in service May 7, 1952, and the fourth unit on June 4, 1952.

The locomotives are operated by regular engine crews without special supervision. The photographs were taken May 3, 1952.



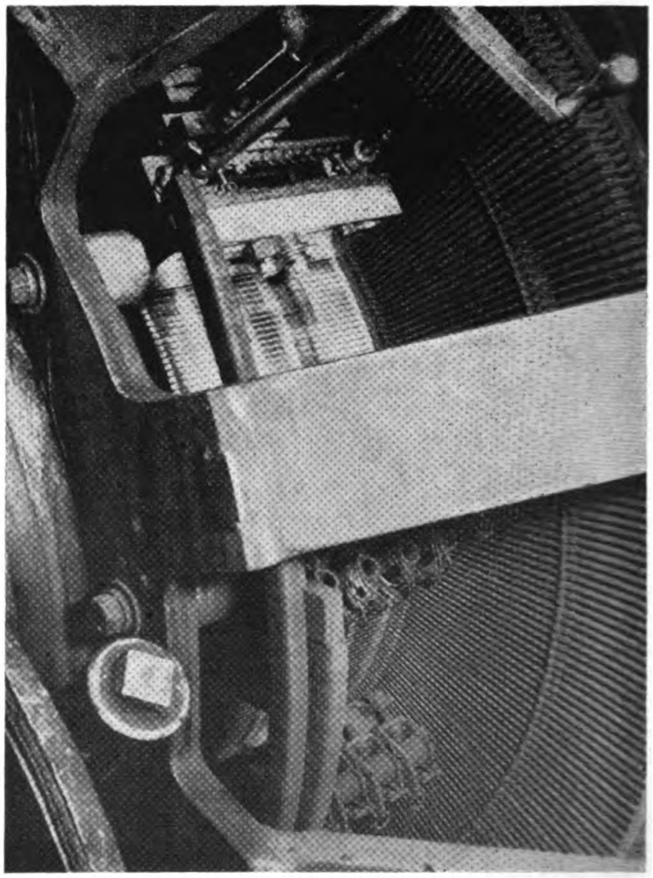
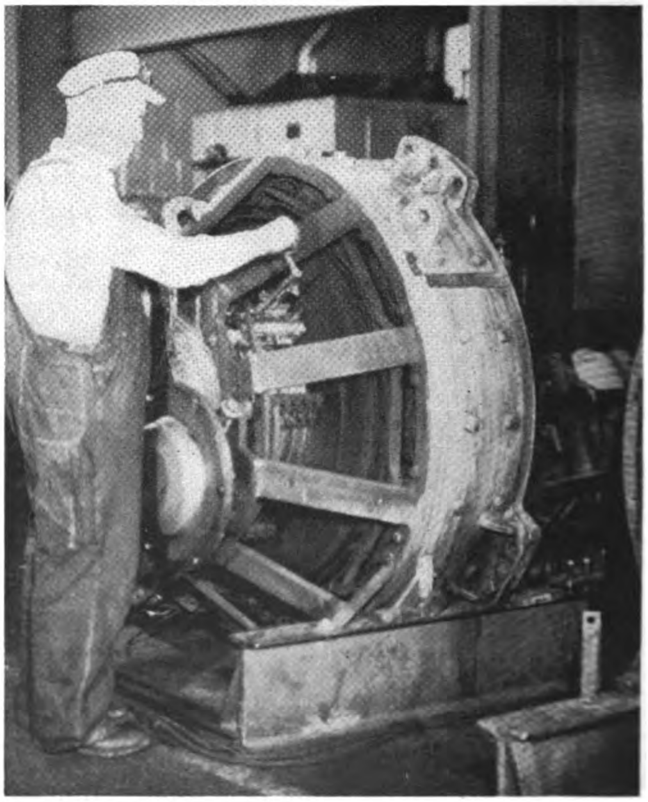


Fig. 1 (left)—A jig mounted on the generator base supports a bearing which takes the place of the bolted engine connection

Fig. 2 (above)—The ball-bearing grinder is mounted on a brush stud

Fig. 3 (below)—Current from a welding generator turns the armature slowly while the operator moves the stone across the commutator



Grinding Generator Commutators in the Shop

A jig for turning the commutators of diesel locomotive generators in the shop is being used in the Marion, Ohio, shops of the Erie. For this purpose, the commutator bearing is in its normal place in the end bell and a special jig, mounted on the generator bed plate as shown in Fig. 1, supports a bearing which takes the place of the bolted engine connection.

One brush holder is removed, and a commutator grinder mounted on the brush stud as shown in Fig. 2. This is a ball bearing type of grinder recently developed by the Martindale Electric Company. It employs a fixed stone and grinding is done with a fine stone only.

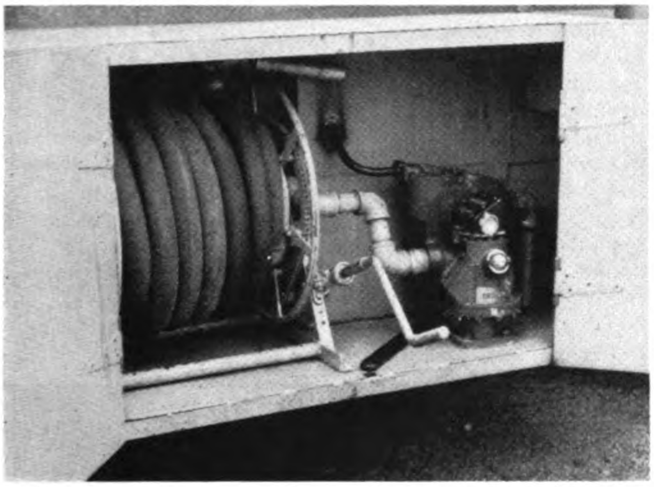
For grinding, the generator armature is rotated slowly by current from a welding generator, while an operator, as shown in Fig. 3, moves the stone back and forth across the face of the commutator. Undercutting is done only when necessary and beveling of commutator bars is not necessary.

Fig. 1—Diesel's "little helper"

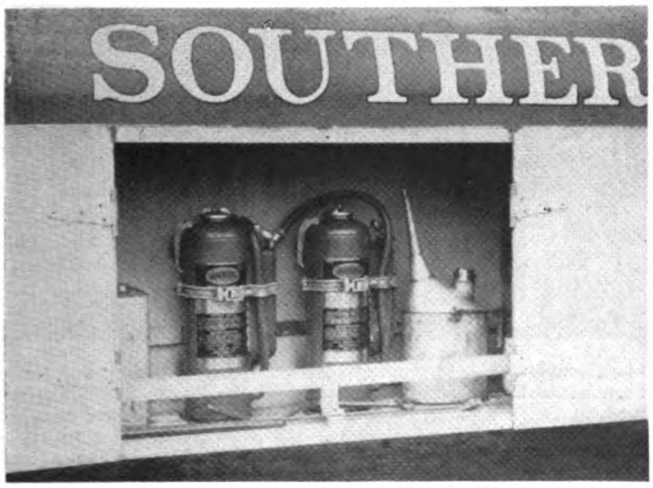
Texas & New Orleans Devices For Servicing Diesels

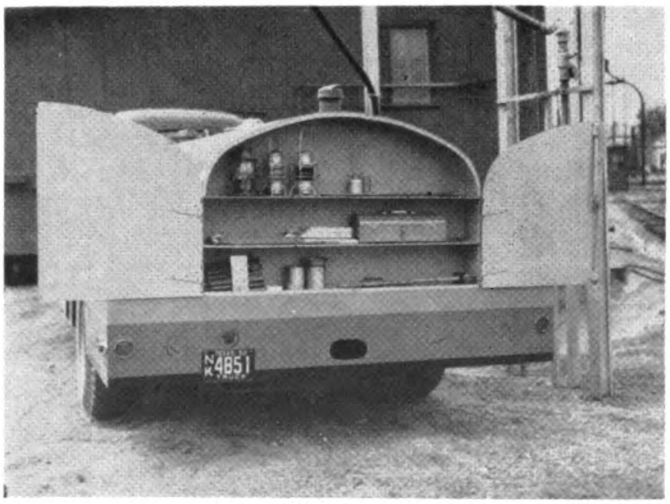
When diesel oil storage and pumping facilities are installed in a permanent manner for a single locomotive at a remote location, the cost per locomotive is proportionally high. Figure 1 shows the T. & N. O.-Southern Pacific version of a diesel's "little helper". This truck delivers fuel oil, crank case oil, sand, and other supplies to diesel switchers in five outlying centers of diesel activity in the Houston area.

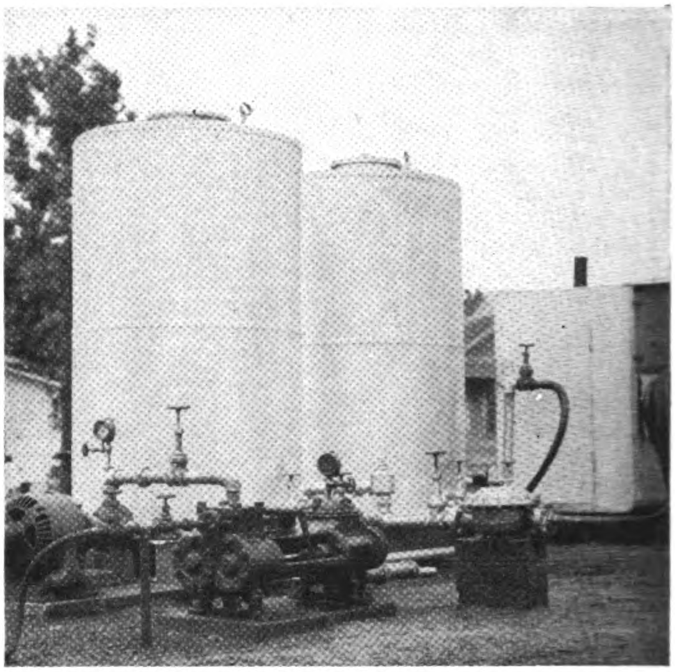
An International KB10 chassis is provided with tank containers for 1,250 gal. of fuel oil, 50 gal. crank case oil, and 1,100 lb. sand. Cabinets contain the miscellaneous supplies. A cabinet at the side is equipped with a pump for delivering fuel oil. It is a Cranco rated at 100 gal. per min. and 125 lb. per sq. in. maximum. The drive is from a power take-off from the truck transmission. Forty-five feet of 1½-in. hose is connected. Figure 2 shows the hose coiled on the hose reel, and also the crank used to recoil the hose.



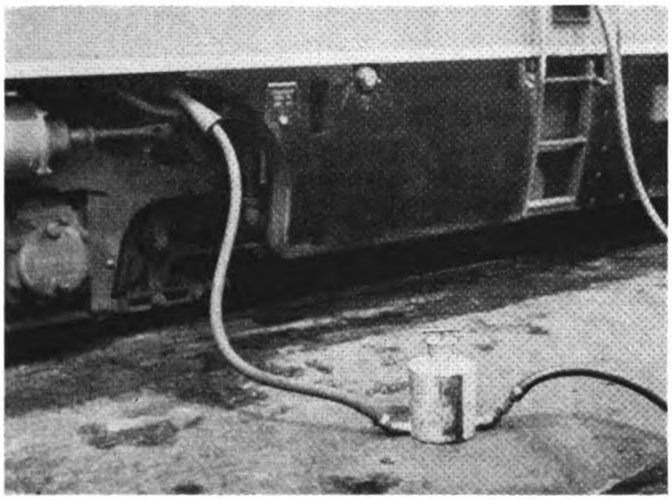
Above: Fig. 2—Fuel pump and hose. Lower left: Fig. 3—Fire extinguishers and journal oil. Lower right: Fig. 4—Miscellaneous supplies







Above: Fig. 5—Filter cart. Below: Fig. 6—Inhibitor tank. At right: Fig. 7—Crankcase oil facilities



A cabinet on the other side has a spout can with journal oil. Two fire extinguishers are also kept in this cabinet, handy in case of fire. This cabinet is shown in Fig. 3.

The cabinet at the rear is shown in Fig. 4. This contains the miscellaneous supplies, including the fuses, flags, torpedoes, water cups and lanterns. These are issued to the locomotive as needed. An oil can and tool box are carried for the mechanic who takes care of minor maintenance work.

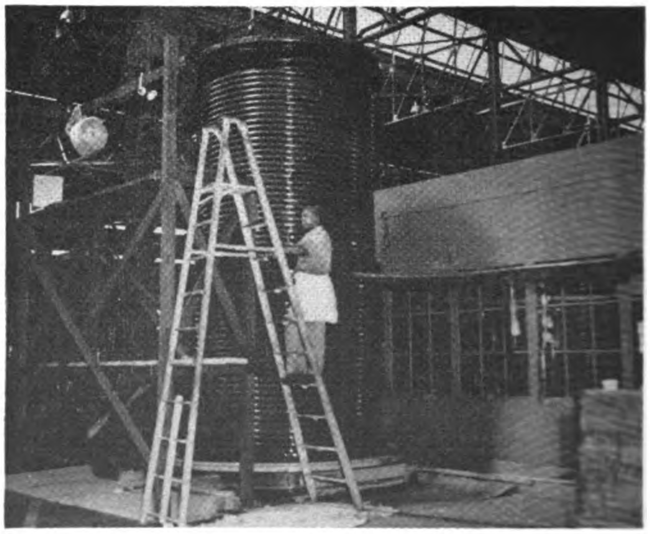
Filter Transporting Cart

Car body and turbo-charger filters at Houston are now cleaned at a contract shop. When they are returned, they are placed in a covered cart. This helps keep them clean, and protects them from damage. This device is shown in Fig. 5.

Applicator for Inhibitor

In order to make easy what was otherwise a troublesome job, the shop forces devised an arrangement which helped get the chemical inhibitor mixed with the water and into the engine cooling water system. Figure 6 shows the small tank built of plate sufficiently heavy to withstand full water pressure. A screwed top enables the chemical to be poured in and then made pressure tight. Water enters through the hose at the right and all chemical has been dissolved before the water compartment is full.

Another arrangement produced by shop forces helps in the handling of crank case oil. Figure 7 shows the assembled apparatus. It enables oil to be drawn from drums and pumped into storage tanks. Dual pumps are provided, one electric and one steam. Oil may be drawn from either or both tanks and discharged through the meter to a hose of sufficient length to reach the locomotive on nearby tracks. In the case of Alco passenger locomotives this is delivered direct into the lube oil cooler. By this means, the lube oil system is pre-charged before starting the engine.



Manufacturing process showing continuous reel of high power cable being made in the Habirshaw division of the Phelps Dodge Copper Products Corp., Yonkers, N Y. This cable, which is designed to carry up to 138,000 volts, will stretch 1 1/3 miles under water to bring 27,000 volts of electric current from the Consolidated Edison, New York, to power stations in Staten Island

DIESEL-ELECTRICS—How to Keep 'Em Rolling

12 Contactors and Relays

In the "horse and buggy days," it took a husky driver to control two horsepower. Today, the engineer on a locomotive can control 6,000 hp. with almost no effort. He does this by using remotely controlled switches, called contactors and relays. These are automatically operated from his seat by means of control handles.

We know that an electric circuit must be completed before current can flow. Also, if we want to stop the current we must open the circuit. On locomotives, contactors and relays do much of this work. Contactors are generally used for power circuits where the current goes above 10 amp. They are usually large and sturdy. Relays do the same job in low-current circuits and are much smaller in size.

What Is the Contactor's Job?

Before we examine contactors and relays in detail, let's think about closing and opening a circuit. An example is the plug on the cord of an electric soldering iron. When you want to heat the iron, you "plug it in." This closes the circuit and current flows to the iron. When you're through you "pull the plug." This opens the circuit and stops the flow of current. Now apply this example to the locomotive circuit shown in Fig. 1. Current cannot flow because the circuit is open at point *A*. One way to close it might be (though we don't advise it!), to take hold of the two leads and butt them together. To do this, the leads would have to be flexible and the ends bare. You would have to supply the force to butt them together and hold them as long as you wanted current to flow. When you wanted to stop the current, you would have to pull the leads apart. This would form an arc, and if the current were large, you might have trouble breaking it. You could blow the arc out with an air hose, or pull the wires far enough apart to break it.

This illustration tells us that:

1. To close a circuit, we must have (1) a force to butt the leads together; (2) at least one flexible lead; (3) a bare copper contact surface on the end of each lead.
2. To carry current, we must hold the wires firmly together.
3. To open a circuit, we must have (1) an opening force; (2) a flexible lead; (3) bare contact surfaces; (4) a way to put the arc out.

Now, let's see how a contactor does these things.

This is the twelfth of a series of articles on maintenance of diesel-electric equipment. This article is written by B. L. Judy and P. W. Pelton, both of the Locomotive and Car Equipment Department, General Electric Company, Erie, Pa.

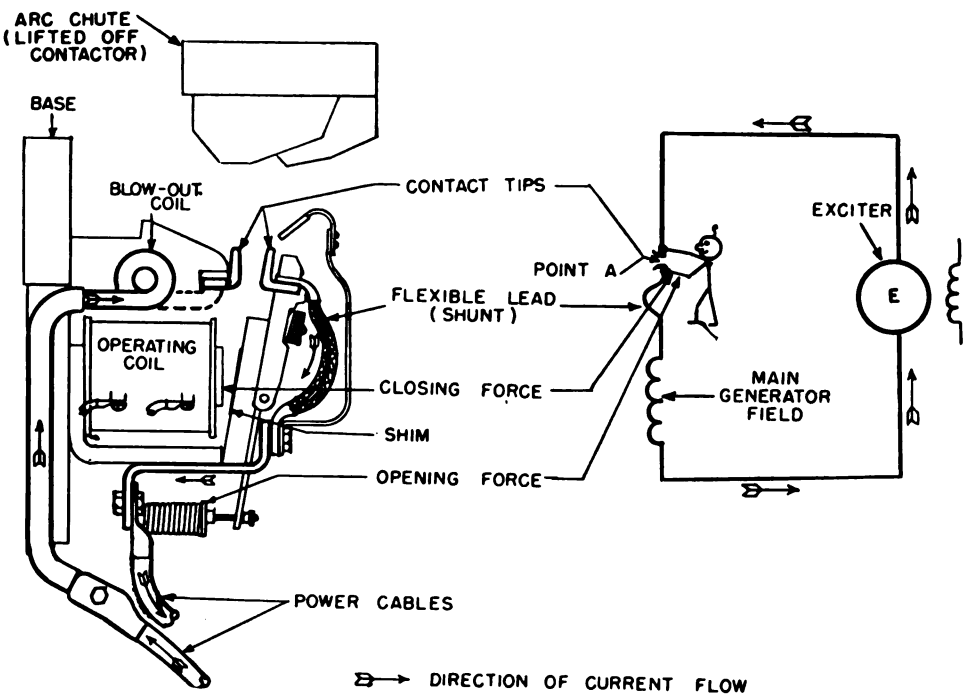
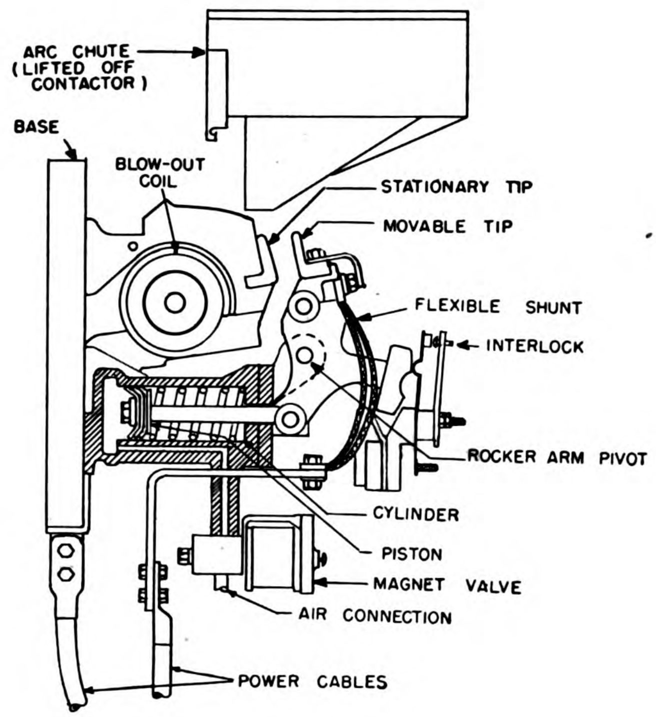


Fig. 1—How we close a circuit with a contactor



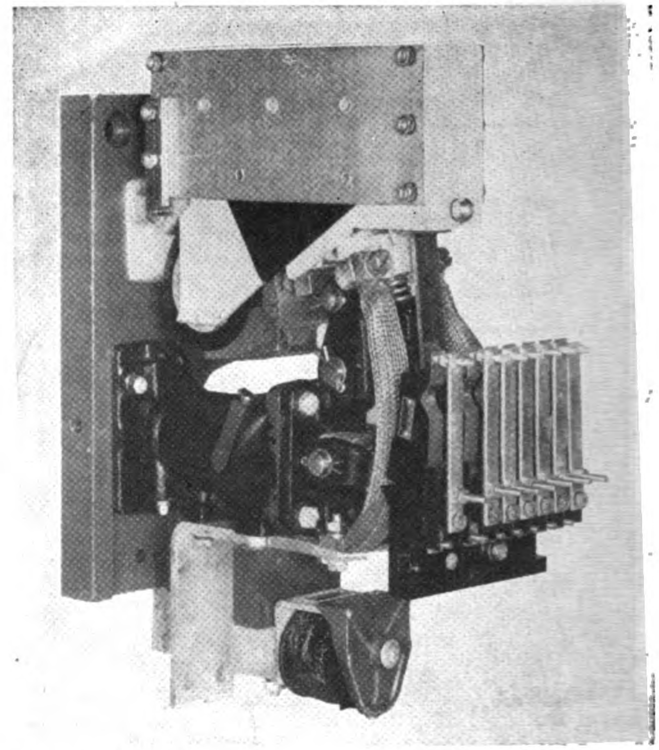


Fig. 2—An air-operated contactor "inside and out"

First, it must supply the closing and opening force. This is usually done in one of two ways.

Air-Operated Contactors

In the main traction circuits that carry heavy currents, contactors operated by air pressure are commonly used. As Fig. 2 shows, such a contactor has a piston, piston rod, spring and cylinder. The piston packing is some flexible material—usually rubber or leather. It is sandwiched between metal washers on the end of the piston rod. The other end of the rod is connected to a lever which moves one of the contact tips, commonly called the movable tip. The cylinder is a casting with the walls honed to a very smooth finish.

All air-operated contactors have some means for lubricating the cylinder. This lubricant does three things. First, it reduces wear and prolongs the life of the piston packing. Second, it lessens the friction between the packing and the cylinder walls, so the piston moves freely. Third, it keeps the packing pliable so it fits the wall closely and forms an air-tight seal. It's important to add lubricant regularly, or the cylinder wall will get sticky. This makes the contactor sluggish. Sluggish contactors are sometimes the cause of road failures. They may also cause main generator flashovers.

The old saying, "the more the better" doesn't hold true for contactor lubrication. If you use too much oil, it will blow out when the contactor operates. Then a film of oil will form on the contactor and everything around it. This oil film is a good dust collector. So, at the best, you will have a messy control compartment. If you want to keep out of trouble, add oil only as recommended by the manufacturer.

On diesel-electric locomotives, there is a supply of low-pressure air called "control air." Among other things, it is used to move the contactor pistons. It should be clean and reasonably dry. Oterwise there is sure to be trouble with gummed-up air devices. Water and sludge settle in the control reservoir and should be drained off by means of the blow-down cock. A gage indicates the control air pressure—usually about 70 lb. If the pressure is below normal, contactor operation will be sluggish. Pressure higher than normal will likely cause no serious trouble. It should, however, be corrected at the first opportunity.

Air entering the cylinder builds up pressure and pushes the piston away from the contactor base. This is the force that closes the contact tips. At the same time, the piston return spring is compressed. When the air supply is cut off, the spring forces the piston back. This is the force that opens the contact tips.

A magnet valve (Fig. 3) is used to control the flow of air to the piston. It is just a two-position air cock remotely controlled by electricity. In one position, it admits air to the cylinder. In the other, it cuts off the air supply and opens an exhaust port to let the air in the cylinder escape. The valve position is determined electrically. When current flows through the operating coil, the valve moves to one position. When the current is cut off, a return spring moves the valve to the other position.

Magnet valves usually require very little maintenance. Many of them have a ground valve seat. If this does not fit properly, the valve will leak. This can usually be detected by a hissing sound. A leaky valve should either be repaired or replaced, for it may cause faulty operation of a contactor. A magnet valve may also have a bent or sticky valve stem or a defective operating coil. Either of these will show up when you try to operate the contactor electrically.

Magnetically-Operated Contactors

Magnetic contactors are operated directly by electricity. When current flows through the operating coil (Fig. 4) the core becomes a magnet and pulls the armature against the core. This is the force that closes the contact tips,

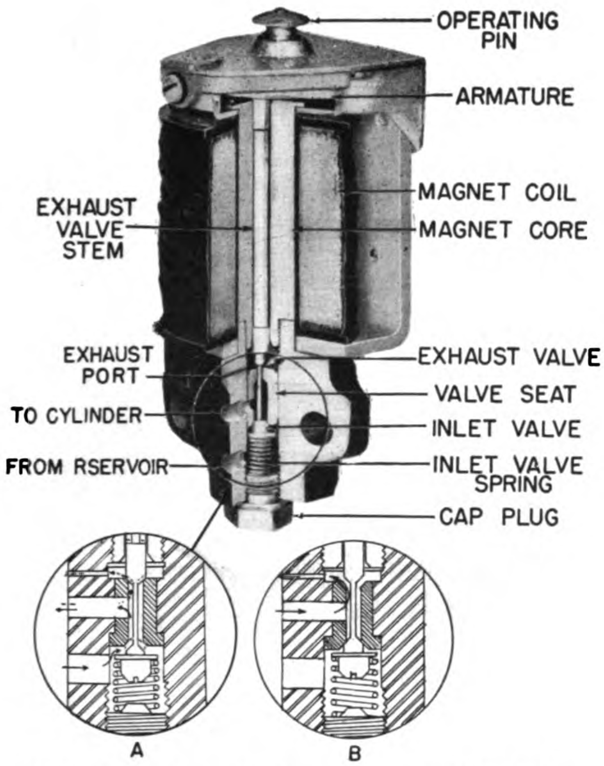


Fig. 3—A typical magnet valve and how it controls air flow: (a) air flowing from control reservoir to cylinder; (b) air flowing from cylinder out of exhaust

and completes the circuit. As the armature moves, it also stretches the armature spring. When the current flow to the coil is stopped, the core ceases to be a magnet. The armature spring pulls the armature away from the core and back against the stop. This is the force that opens the contact tips. You can see that the coil, core and armature of the magnetic contactor replace the magnet valve, air piston and cylinder of the air-operated contactor. So there is no worry about air supply or lubrication on a magnetic contactor. But there are a few other points to watch.

The knife edge on the armature may become worn. This can cause faulty operation. Don't try to repair such an armature—replace it. The armature spring is exposed for easy adjustment—so someone may "monkey" with it. If a contactor operates improperly or fails to pick up, refer to your instruction book for adjustment of this spring.

The armature shim is another place to watch. It is brass or other non-magnetic metal, and is used to keep the armature from sticking to the core. If this shim gets worn or lost, the armature will tend to stick and make the contactor sluggish. If you suspect this, a look at the shim will tell if it is the offender.

There are occasional failures of the coils used on magnet valves and magnetic contactors. If the coil has "roasted out," it will have a characteristic burned smell. If it is open-circuited, you may be able to find it with a "bell set." However, some bad coils are difficult to find because they have only partly failed. An inexpensive ohmeter or circuit "analyzer" is essential in spotting them. Coil resistances are usually given on the locomotive wiring diagram. In most cases, coils with resistance readings 10 per cent above or below the value given should be replaced. Grounded coils are rare, and will show up on the regular megger or hi-pot tests.

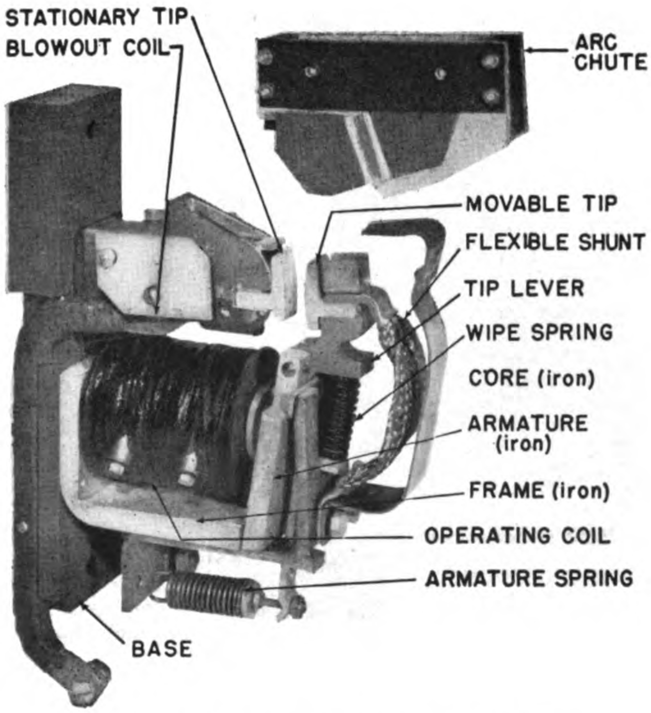


Fig. 4—The principal parts of a magnetic contactor

Shunts Must Be Flexible

When we talked about butting the leads together by hand (Fig. 1), we noted that at least one of them must be flexible. All contactors have such a flexible lead, called a shunt. It is made up of woven strands of very fine copper wire. Normally, it will last for several hundred thousand operations of the contactor. But, since the copper strands are very fine, the shunt can be easily damaged. On larger contactors, this may happen through misdirected arcs. If an arc strikes the shunt, it may weld together a large number of strands. Then this part of the shunt is no longer flexible. The result is usually a broken shunt. While a damaged shunt may last to the next inspection, it is a good idea to replace it as soon as possible.

Loose connections also shorten shunt life. If the bolts that fasten the ends of the shunt to the contactor get loose, there is a poor connection and the shunt terminals will overheat. This makes the copper strands brittle and discolored. Such a shunt will break in a little while. So, when you inspect a contactor, examine the shunt and its connections.

Contact Tips

The exposed surfaces which actually make contact and complete the circuit (Fig. 5) are called contact tips. They get mechanical wear and electrical burning. They are usually made of copper and bolted in place. If these bolts get loose, the tips will overheat. Your troubles won't stop here. The heat will carry out to surrounding parts and cause warping and binding. This makes it tough to get them off. So it pays to keep the tip bolts tight.

Tips are the "half soles" of the contactor. Any tip worn half to three-fourths through should be replaced. Sometimes the wrong tips have been put on a contactor. This is a bit like exchanging shoes with your wife. Use the right tips, and when you mount them, be sure the contact surfaces line up (Fig. 6). Cocked tips hit first

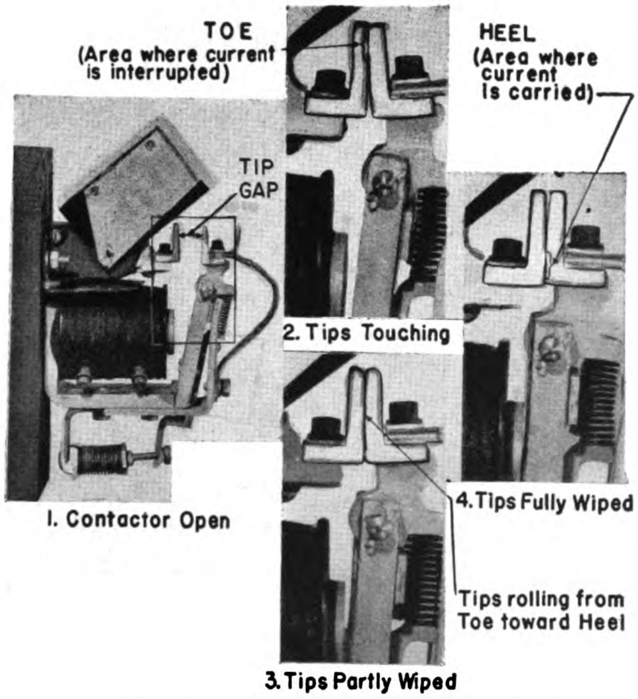


Fig. 5—Important points about contactor tips

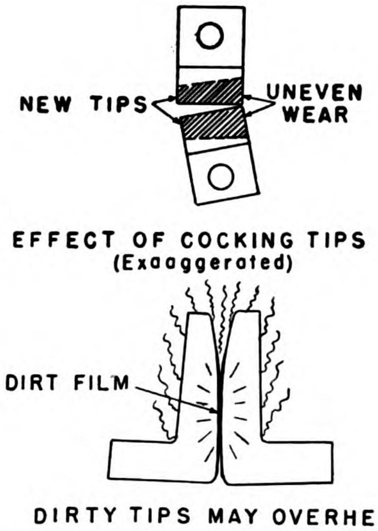


Fig. 6—Two reasons for trouble with contact tips

on one edge and wear away rapidly. The best way to prevent this, is to line up the tips before tightening the bolts. Then hold the tips in position with a wrench while you set up the bolts.

Contact tips are designed to carry current on the heel, and to interrupt it on the toe (Fig. 5). Since the heel does not break the current, it should remain in pretty good shape, though it may discolor. The toe will normally become pitted and discolored. Sometimes drops of molten copper will form beads on the edges of the tips. If these interfere with contactor movement, knock them off with a file; but don't make a practice of filing tips.

If oil gets on the surface of contact tips, it forms a film which collects dirt. When the contactor operates, this oily dirt is pressed into a thin coating on the tip surfaces. If this coating builds up (Fig. 6), it will form a high resistance connection. The tips will overheat, and may even weld together. So, if oil gets on the tips, wipe it off with an oil solvent and file the tip surface very lightly.

Tips on Contact Tips

When a contactor is open, there is a space between the tips. This is called the "tip gap" (Fig. 5). As the tips wear, it gets larger. On most contactors, there is no way of adjusting it. After a contactor repair job, it's wise to measure tip gap. If it is outside limits, the contactor may have been assembled wrong.

If you close a contactor by hand, you will notice that after the tips touch the armature keeps moving until it touches a stop. This extra movement is called "wear allowance" or "wipe." It is necessary if the contactor is to do its job properly. Wipe is a means of making up for tip wear in much the same way as a slack adjuster makes up for brake shoe wear.

When you inspect a contactor, check the operation of the tip lever and wipe spring. You can easily do this by pulling the tip lever away from the armature with your finger. When released, it should snap back into place sharply. Tip wear may cause copper dust to gather on parts of the contactor. This may cause an insulation failure or burnup, so brush it off if you find it accumulating.

Sometimes contactor tips fuse solidly together. This is called "tip welding," and is caused by: (1) tips worn until there is little or no wipe left; (2) weak or missing wipe springs; (3) sluggish contactor operation; (4) dirt on contact tips. You have already learned what to do about all these conditions.

Stop That Arc

When a contactor opens a circuit carrying current, an arc is drawn between the contact tips. This is very hot—like the arc used in electric welding. If we want the contact tips to last any time, we must get rid of the arc as quickly as possible. If the arc is small and weak, it will go out easily when the tips are pulled a short distance apart. If it is large and strong, the story is different. Then the tips must be pulled several feet apart to put the arc out. There isn't room in a locomotive to do this, so we use another trick. An arc can be blown out, just like you blow out a flame. This could be done with a jet of air. On contactors, however, it is simpler and easier to blow it out electrically.

Near the stationary tip of locomotive contactors you will find a "blowout" coil made up of a few turns of heavy strap copper (see Figs. 2 and 4). This coil has an iron core inside it. The current flowing through the contact tips also flows throughout the "blowout" coil and causes the area around the coil to become magnetic. When air arc is drawn as the contactor opens, it will be in this magnetic area. The magnetic action will force the arc to the ends of the tips and out, as if it were blown by an air jet.

The blowout coil or core may be damaged by heating or arcing. Then it cannot do its job and the arc will not be blown out. This will very quickly burn up the contactor. Many such failures are the result of overheated tips. The coil is close up to the tips, so it gets damaged when they overheat. Sometimes this is not noticed when the tips are replaced. Then, soon after the locomotive is dispatched, a road failure occurs.

It's good to blow the arc out from the contact tips, but you must be careful what becomes of it! If it strikes any surrounding equipment, it may do a lot of damage. If it strikes the locomotive frame, it will usually trip the

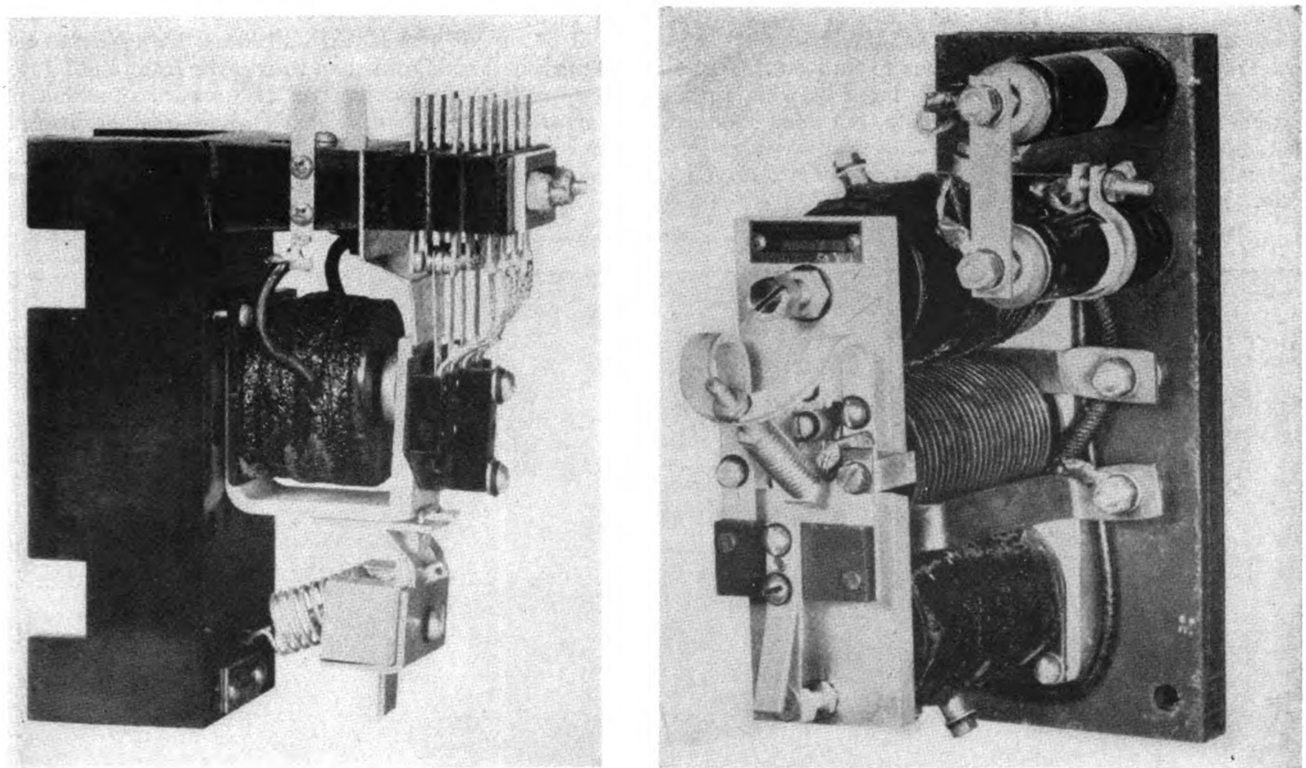


Fig. 7—Two Types of relays commonly used on diesel-elect. locomotives

ground relay. To prevent trouble, a box (arc chute) is used to confine and direct the arc. It is made of material that will not conduct electricity and that will withstand the heat of the arc. Molded asbestos is commonly used, and, in some cases, clay products like fire brick. Most of these materials are easily broken if not carefully handled. Broken arc chutes should be repaired or replaced as soon as found. When the side plates of the arc chutes are burned three-fourths through, they should be repaired or replaced. You can buy cement compounds which are good for filling these burned places. If the outlet of an arc chute gets plugged up, it should be cleaned with a steel brush or putty knife. When putting an arc chute back on a contactor, be careful to see that it is fastened securely and does not bind the contact tips.

Interlocks Follow Through

As you know, there is a "firing order" for the cylinders in your auto engine. Sometimes, it is also necessary to have a "firing order" for locomotive contactors. In this case the "firing order" is set up by means of interlocks. These are small contact fingers (Fig. 2) that work at the same time as the main contacts. They are usually connected in the low-voltage or battery circuit and give a signal when the main contacts operate. Two kinds are common. One is "normally open." That is, the interlock circuits are open when the main contacts are open and closed when the main contacts are closed. The other is "normally closed." That is, the interlock circuits are closed when the main contacts are open, and open when the main contacts are closed. Interlocks, being in low-voltage circuits, usually have silver contact tips to reduce electrical resistance. Oil on these tips will collect dirt. While dirty interlock tips don't overheat, they do fail to make contact. This fouls up the "firing order." So, if you find dirty interlocks, clean them with a clean lintless cloth. Sandpaper and emery cloth should not be used. They leave grains in the surface that keep the tips from making contact.

When you are working around contactors, remember the interlocks are small and easily damaged. Keep an eye on the handle of that wrench. When the job is finished, take a look at the interlocks to see that they haven't been bent.

Loose connections cause trouble on interlocks too. You won't get an overheated connection, but you will get all sorts of queer control operations. A regular check of these connections will help rid your locomotive of these headaches.

On most contactors, the interlock tip gap can be adjusted. Once set, it is seldom necessary to readjust. However, it's good to look at these gaps—you may find a road failure before it happens.

Rarely, you may find contact material building up on an interlock tip. Remove it with an ignition file. As a rule, don't file the tips—it shortens their life. Fingers should be replaced when the silver on the tips begins to wear through.

Remember, interlocks are an important part of control and vital to locomotive operation. You should maintain them like other contactor parts.

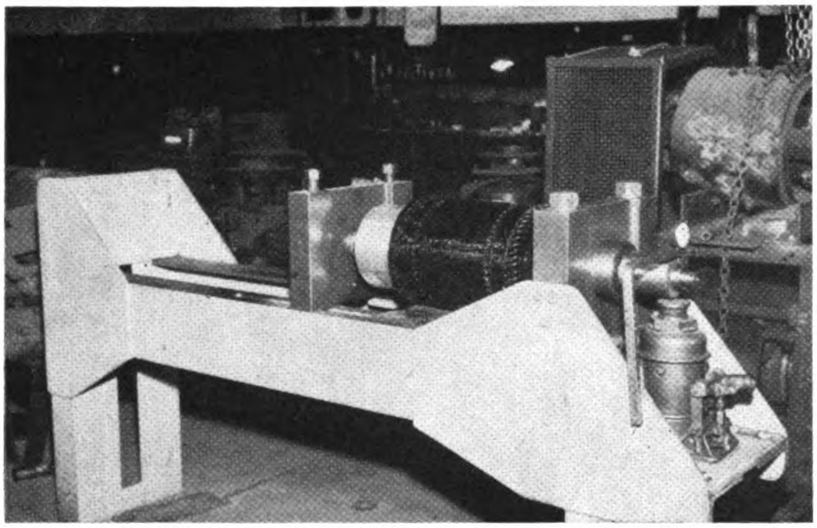
Relays—The Mighty Midgets

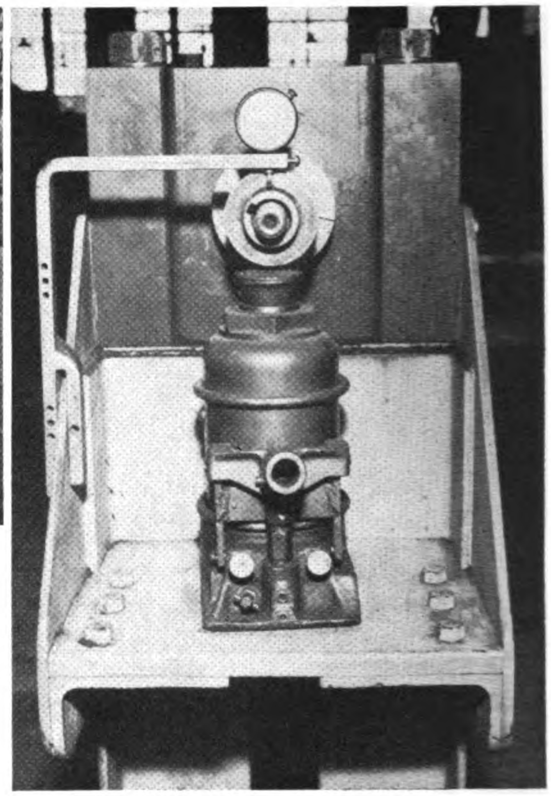
A simple relay looks like a small magnetic contactor. Actually, the main difference is in the job it does. It is a light contactor used to "relay" a signal. It is inspected and maintained like a magnetic contactor. Contact fingers and tips should be treated like contactor interlocks. Most relays are covered to shield them from dirt. What little maintenance is required should be done by a man who knows his job and has the proper tools. Relays just can't be maintained by the old-time "hammer and oil can" method.

Since relays are used for a number of jobs, they come

in many sizes and shapes (Fig. 7). If you don't know how they work, you may be curious to find out. That's good. Look them over, but don't monkey with them. The best rule is "looka alla you wanta, but dona squeeza da tomatoes."

Locomotive control is like the brain and nerves of your body. It has to be in good order or the whole machine will be out of whack. We all know it's easier to avoid a nervous breakdown than to recover from one. Just so, it's easier to prevent control failures than to hunt them out and correct them. That's where regular inspection and maintenance pay off. A proper plan faithfully followed will go a long way toward keeping your locomotives rolling.





Above: An armature in place preparatory to straightening the shaft. Right: The dial gage measures amount and direction of the distortion for straightening with the jack, and checks the finished job for true running.

Armature Shafts Straightened in Place

Armature shafts from 1-hp. motors to 20-kw. generators are straightened in place at the Illinois Central Burnside shops in Chicago by the use of a machine developed and patented by D. K. Pope, electrician at that point.

The machine not only straightens the shaft, but it straightens it at the exact place where it was bent and with a force directly opposite to that which distorted the shaft in service; thus it avoids putting a second bend in the shaft which would compensate for the first bend but would throw the shaft out of balance. The machine also avoids removing the shaft from the armature and the possibility of loosening the fit between the two. The shaft is straightened between the hub of the driving pulley and the adjacent bearing housing, where it normally becomes bent in service.

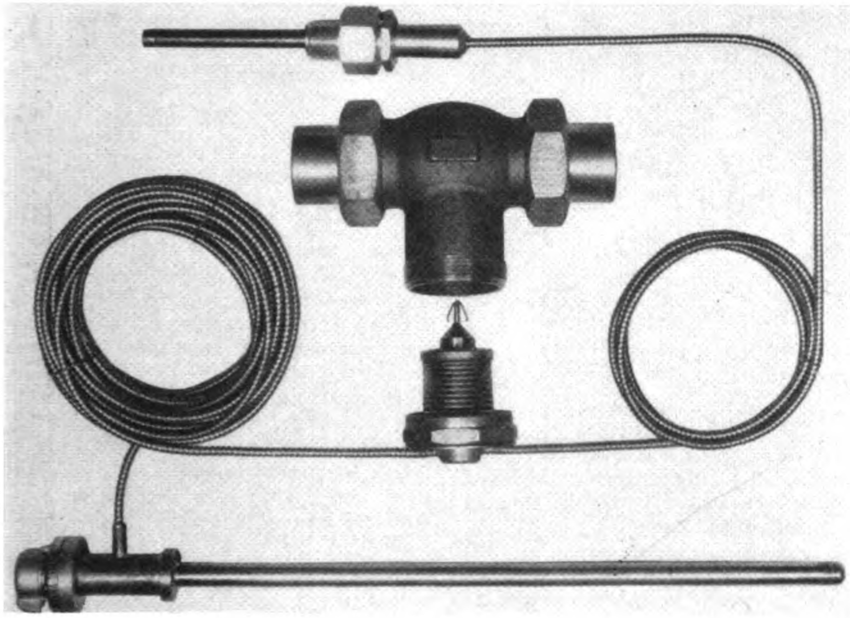
The machine holds the armature and its shaft in the same way as if it were mounted in its own shaft bearings. It has a dial indicator to tell the amount and direction of distortion and to show when the shaft has been restored to the straight condition.

Two mounting blocks are supported by a suitable frame, one of which is fixed in position by bolts while the other slides longitudinally to accommodate different lengths of armatures. The mounting blocks are in two halves joined together with studs and nuts. Each part has a half-bearing for rigidly securing the armature shaft in place during the straightening operation. Bushings are employed to accommodate different sizes of armature shafts.

After the amount and direction of the distortion have been determined, the shaft is straightened cold with a jack set on a bed near the stationary mounting block. During this operation an adapter sleeve fits over the end of the shaft in place of the driving pulley. This prevents damage to the shaft from the application of the straightening force and insures that the force will be applied where it is required.

Normally about .010 in. springback is allowed for. Thus if a shaft is bent .008 in., force is applied by the jack until it is .010 in. beyond straight, or a total of .018 in. If the .010-in. springback assumed is correct, the shaft will then return to true after the force is removed. If the springback turned out to be .015 in., another .005 in. of bend would have to be put in the shaft. If the springback were less than .010 in., say .008 in., the shaft would be revolved 180 deg. and bent back the excess .002 in.

The machine is also suitable for removing the shaft from the armature. For this operation one jack is mounted with the base against the end of the machine opposite the dial gage, while a second jack holds a concave tray for supporting the armature after the shaft has been removed. The armature shaft is held, as in the straightening operation, by the two mounting blocks.



Non-Electric Heat Control

A heat control that operates without electric thermostats, relays, motors, or solenoids, has been marketed by Fulton Sylphon Division, Robertshaw-Fulton Controls Company, Knoxville 4, Tenn. These controls are actuated by steam.

This railway car heat control can economically convert any hot car to a comfortable automatically controlled car. It can be applied to steamheated suburban cars and coaches, or cars of other types. The supply of steam to the floor radiation on each side of the car is regulated by a 1 in. Sylphon modulating, differential control valve which has two temperature control bulbs, each connected to the hot chamber bellows by capillary tubing.

The fresh air bulb is mounted under the car and is responsive to outside air temperatures. This bulb automatically adjusts the car temperature. The car control point is raised from 70 to 75 deg. F. if the outside air drops from 50 to 0 deg. F.

The car body bulb is mounted under a seat and is responsive to car body temperatures. This valve is a modulating controller so when the car bulb is 68 deg. F. the valve is wide open. When the car temperature reaches 70 deg. F. the valve is tightly closed. When the car temperature is between 68 and 70 deg. F., the valve is in some throttled position. The only remaining equipment is an emergency manual shut-off valve and thermostatic traps to drain condensate.

Automatic Dynamic Braking Control

A system of automatic braking control and notchless tractive effort control for Alco-GE road switching, freight and passenger locomotives has been announced jointly by the American Locomotive Company and the General Electric Company, both of Schenectady, N. Y., to maintain braking over the normal speed range. The automatic control is said to provide greater braking capacity on road freight and passenger locomotives, ranging from 2,100 hp. at high speeds to 2,660 hp. at approximately 24 m.p.h.

With automatic control, braking capacity of 1,900 hp. is maintained on four-motor road switchers and capacity of 2,900 hp. is available on six-motor road switchers.

The system eliminates the necessity for the engineman to adjust the braking lever manually at different speeds to avoid exceeding a pre-set limit as shown by the load ammeter or the braking warning light.

From a previous limit of 800 amp. at all speeds, the new system provides a limit of from 800 amp. at high speeds up to 900 amp. maximum on road freight and passenger units.

Notchless tractive effort control, available on Alco-GE 1,600 hp. freight and switching locomotives as a modification, affords variations of speed and tractive effort necessary in hump service and in starting heavy trains under difficult conditions. This device provides a varying limit for tractive effort in any particular throttle notch, by utilizing current limit features of the locomotive control system.

In starting a heavy train under difficult track conditions, the engineman can use notchless tractive effort control to increase tractive effort to the exact point required to move the train without wheel slippage.

◆

Air-Operated Transfer Pump

An air-operated transfer pump has been developed especially for handling diesel lube oil by the Wilkinson Equipment & Supply Corp., 6958 South Wentworth, Chicago 21. It is capable of pumping a 55-gal. barrel of SAE No. 40 within 5 min. time, pumping as much as 18 gal. per min. depending on the viscosity of the fluid handled. The pump also eliminates spilling of oil.

It weighs only 15 lb. which speeds up transfer from one drum to another; fits all standard 2-in. drum openings, and is supplied with an adjustable bung hole adapter and air valve for control of speed. In addition, there is a metering system for constant visual control of quantities pumped.

The pump, it is said, eliminates fire hazards because handling of the fluid is clean, quick and completely enclosed.

In addition to lube oil, the pump will handle such fluids as motor oil, gasoline, naphtha, cleaning solvents, kerosene, etc.

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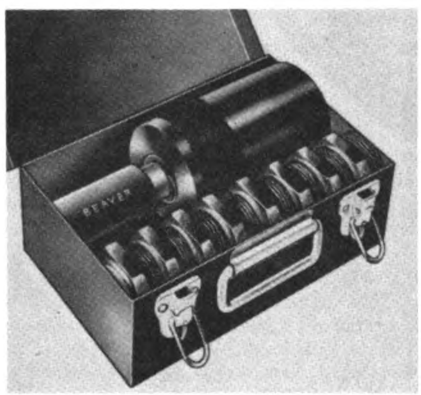

Three Part Nipple Chuck

A chuck, the model 55, which is capable of threading ⅛-in. to 2-in. pipe has been

marketed by Beaver Pipe Tools, Inc., Warren, Ohio. Called the Universal Nipple Chuck, it has three parts—a polished steel body, a sliding plunger and a hardened threaded shank. No wrenches are required to remove the nipple.

Adapters allow for all sizes from ⅛-in. to 1½-in. pipe. No adapter is needed for 2-in. pipe. An inserted pin retains the sliding plunger in working position.

The device can be used four ways: with a pipe machine, a power drive, any pipe vise or a machinist's vise to pay for itself by converting short lengths of pipe into all-thread, close-thread or average nipples.

◆

Machinist's File

A new file for industrial use has been announced by Henry Disston & Sons, Inc., Philadelphia, Pa. Called the Multi-metal file, the device is designed for the machinist who must work on a wide variety of metals. These files have special tooth shapes and spacing so that the same tool will cut aluminum, brass, copper, iron and steel, and other metals. Sides are double-cut; edges are single-cut.

They are packed six to a box, in lengths of 10, 12 and 14 in.

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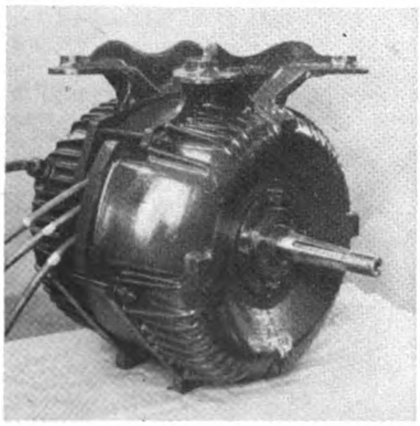
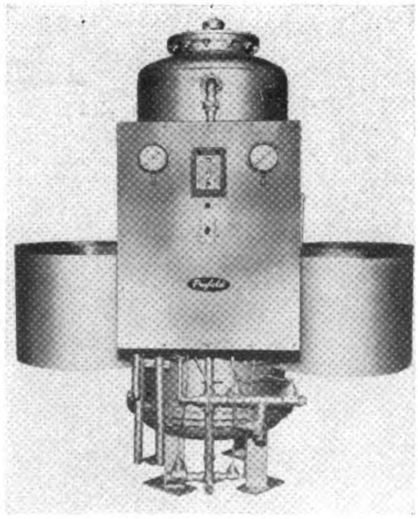


Power Supply System For Cabooses

An alternator-rectifier system, designed to furnish power to cabooses and similar rolling stock for the operation of commutation equipment and other electrical devices, has been developed by the General Electric Company.

This alternator is axle-driven. When operated at a gear ratio of 5.28 to 1, the system will produce 80 amp. d. c. at 40 volts d. c. over a car speed range of 10 to 90 m.p.h. With lower gear ratio and less speed range, the equipment can be made to provide even greater output.

The metallic rectifiers have a special protective coating and are forced ventilated. The control limits both the maximum output current and voltage.



Mono-Bed Demineralizer

The addition to its demineralizing equipment line of a fully automatic Mono-Bed unit has been announced by the Penfield Mfg. Co., Meriden, Conn.

This demineralizer performs all the operations, including the regeneration cycle, completely automatically. Whenever the effluent's conductivity falls below standard, the treated water is automatically discharged and lights (or other warning system) signal the need for activation of a regeneration cycle.

The simple turning of a single dial or switch then puts the unit through its regeneration cycle automatically, including rinsing and recutting in the effluent when desired resistivity is reached.

The unit employs the ion exchange technique, a combination of cation and strong anion resins mixed in a single tank through which the raw water passes.

It is available in flow rates from a few gallons per hr. to 5000 gal. per hr. and up. The device requires no steam power and provides a treated water effluent with a mineral content of virtually zero hardness.

◆

Locking Plug For Portable Extensions

Corlock is the name given to a heavy-duty locking plug now being produced by Cornish Wire Company, Inc., 50 Church street, New York 7. A waterproof, shock-

resistant jointure of the plug and wire is achieved by molded rubber construction. The plug is approved by Underwriters' Laboratories for 20 amp. at 250 volts and 10 amp. at 575 volts. It is available in flexible cord sizes as follows: 18-3 and 16-3 SJ; 18-3, 16-3, 14-3 and 12-3 in S, SO and SJO hard-service coverings. A twist upon plugging in establishes sure connection that stays unbroken until it is desired to disconnect.

◆

Railway Car Cleaning Compound

A new compound called Mabros has been developed by the Phillips Scientific Laboratories, North Arlington, N. J. It is claimed that when the product is added to the wash water for railroad cars, 90 per cent of the time and effort is saved. While washing, it produces corrosion resistance, weatherproofing, roadfilm retardant for the carbody, glass, metal, etc.

One teaspoonful is added per bucket of water and the car is washed in the conventional manner, either by hand or machine.

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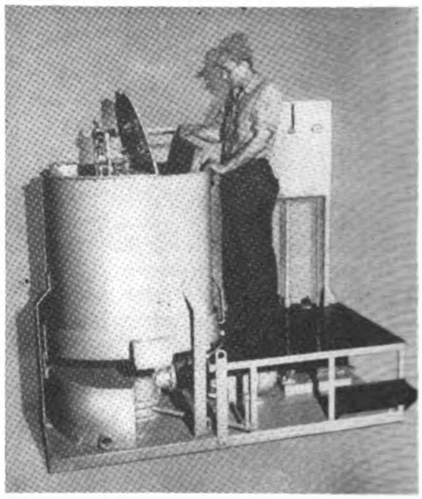
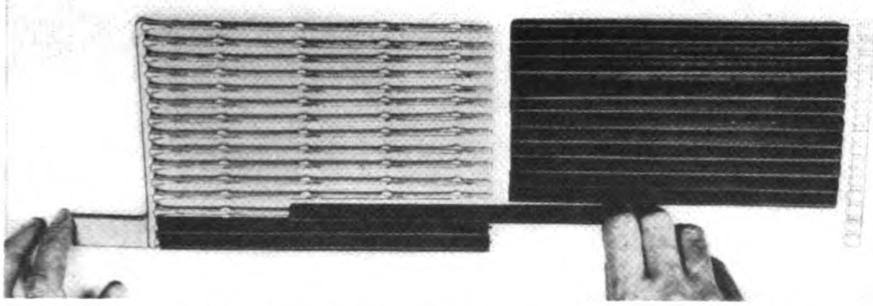


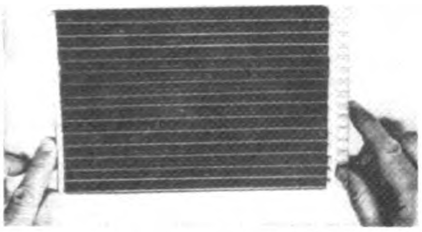
Filter Cleaning Machine

Permanent-type air-filter elements used on Diesel locomotives and passenger cars may now be cleaned by a machine developed by the Paxton-Mitchell Company of Omaha 5, Neb. The machine, known as the Safe-N-Ezy Washer, when operated by one man working at a normal rate of speed, can clean 600 or more 19½-in. by 19½-in. by 2⅛-in. air filters in an eight-hour day.

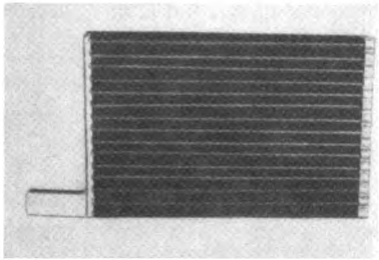
Even the dirtiest filters come out clean when processed in the Safe-N-Ezy washer-oiler because the machine works on the principle of centrifugal force. Filters spin in an interior basket of the washer throughout the complete cycle to become cleaned, rinsed, spun dry and oiled all in one continuous operation. Floor space required by the cleaner is 6 ft. 10 in. by 4 ft. 4 in.



Silvium metal grid core rods being inserted into slotted hard rubber tubes



After packing active material into slotted hard rubber tubes, the polyethylene bottom bar is put on so that each tube is sealed by its individual plug



The assembled positive plate of the improved Exide-Ironclad battery for industrial use

Heavy Duty Storage Battery

The Electric Storage Battery Company, Philadelphia, has announced that the life of its Exide Ironclad industrial storage batteries used for railway motive power and other heavy duty service, will be prolonged by six outstanding improvements, including a new silver alloy grid metal, and a non-corroding permanent positive-plate tube sealer.

Corrosion of the positive-plate grid is one of the principal causes of battery failure, and the manufacturer states that the introduction of a new alloy, Silvium, in the construction of the positive-plate grid of the improved Exide-Ironclad battery, reduces the corrosion factor and assures a longer positive grid life. Silvium is an alloy of silver, lead and other components and is highly resistant to corrosion.

Another cause of curtailed battery life, which has always plagued storage battery manufacturers, is the loss of the active material from the positive plate. When it becomes sediment in the bottom of the cell, it represents lost capacity and reduction in battery life. There also is the threat of possible trouble from short circuits within the battery by an accumulation of loose active material.

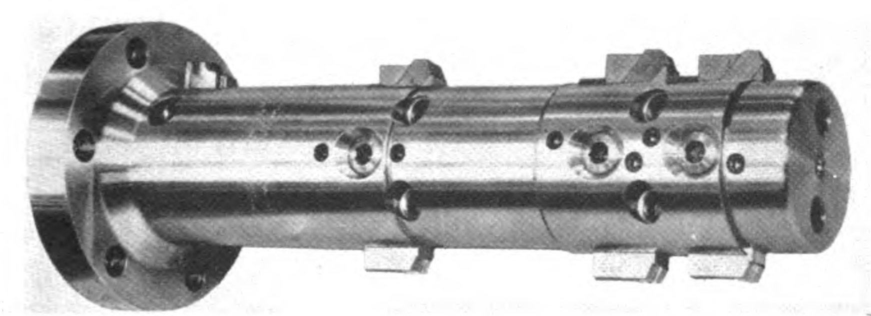
The Exide grid is made up of metal core rods which are inserted in slotted hard rubber tubes. Active material is then packed into the tubes surrounding the rods. The slots in the tube permit free access of the electrolyte to the active material, but they are fine enough to prevent it from washing out.

The bottoms of the tubes were formerly sealed with an alloy bar. After considerable service life, however, corrosive action on this metal bar closing the tube bottoms would eventually breach the seal. Active material would then seep out and be deposited in the bottom of the container. Molded polyethylene is now used to replace the metal bar and seal in the tubes at the bottom against loss of active material. The new tube sealer is non-corroding, and is unaffected by the electrolyte or electrolytic action. It is pointed out that high capacity is thus retained for a longer working life because the active material is held in place in the tube.

In addition, polyethylene is an insulating material. Extending across the entire bottom of the plate, it acts as a safeguard against shorting between plates. The elimination of metal at the bottom of the positive plates, it is claimed, assures better negative plate performance because of low local action and the reduction or elimination of shedding of active material.

The other improvements in the Exide-Ironclad battery are a new homogeneous sealing compound; a seamless shock proof jar; unbreakable plastic vent plugs, and a corrosion and impact resistant plastic steel tray coating.

Now available, the new improved Exide-Ironclad battery will be sold at no increase in price.



Car Wheel Boring Tool

A new device, the "Three-In-One" Car Wheel Boring Tool, has been perfected to prevent bar deflection and machine damage when boring cored hub wheels in railroad repair shops.

Operation of the tool, designed by the Davis Boring Tool Division, Giddings & Lewis Machine Tool Company, Fond du Lac, Wis., is embodied in a set of extra cutters located between the first roughing cutters and the finishing cutters. These intermediate cutters provide for continuous cutter contact during the boring cycle regardless of the openings in the wheel hub.

The apparatus is equipped with micrometer expansion blocks in which cutters of solid tungsten carbide are used. These blades are rigidly supported which prevents chattering and cutter breakdown when boring.

Adjustment of cutters to required bore size is easily made. As much as 1⅛-in. diametrical adjustment is possible. Approximately 0.03 in. of metal is removed in the finishing cut and the complete boring cycle is only 2.3 min. per wheel.

◆

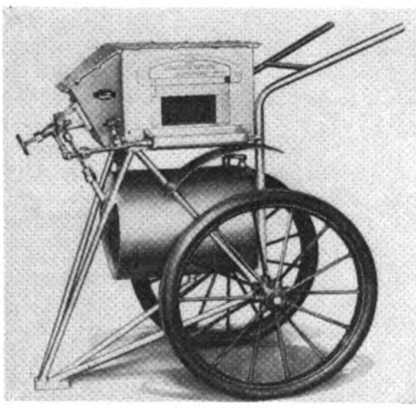
Glass Fiber Fire Shield

Effective protection against radiant heat and light weight are a few of the advantages of a resilient Ultralite glass fiber insulation fire shield developed by Gustin-Bacon Manufacturing Company, Kansas City, Mo. The shield, according to its maker, affords protection to firefighters within a few feet

of a fire, enabling them to direct operations, turn off valves, effect rescues and fight the fire. Firemen have been able to approach within 18 in. of a high pressure gas fire (850 lb. per sq. in. from a 6-in. pipe) in safety.

The user maintains vision through a peep hole at eye level. His face is shielded by copper wire which disseminates and dissipates heat. A self-sealing opening for a hose nozzle can be cut through the shield.

◆



Rubber-Tired Rivet Forge

Recently made available is a line of rivet forges equipped with semi-pneumatic tires. These units, introduced by the Johnston Mfg. Co., Minneapolis, Minn., are designed for heating rivets prior to use in fastening operations. They are equipped with a non-clogging vacuum oil burner.

The tires absorb shock and vibration and reduce noise when the forge is moved to a new location. These forges can also be equipped with regular steel wheels, and steel-wheeled models now in service may be converted. They are also available in stationary types.

Stick-Type Wax Lubricant

A solid lubricant has been marketed for lubrication of cutting tools, threaded metal fastenings and other metallic forming tools used in production manufacturing, tool rooms and maintenance workshops. The product called Tool Saver is a formula of wax ingredients and is compounded by The DoAll Company, Des Plaines, Ill.

According to the manufacturer, it helps prevent detrimental abrading, scoring or burning of a tool or the work and noticeably improves surface finish on the machined material.

A pound of the product is supplied in a handy push-out cardboard dispenser tube measuring 11 in. long by 2 in. in dia. It is supplied directly to the cutting edges of the tool or to the surface of the material that is to be machined.

◆

Car Heating Conduit Seal

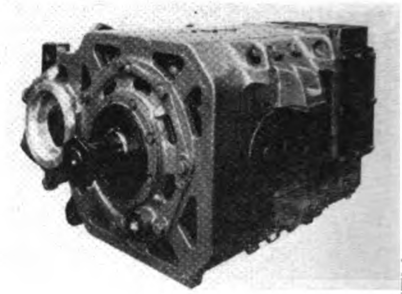
Recently introduced for use in railroad passenger car heating systems carrying 400 deg. F. steam under 250 lb. pressure is a new conduit seal devised by the Vapor Heating Corporation, Chicago. It utilizes Hycar rubber, developed by the B. F. Goodrich Chemical Company, Cleveland, Ohio, as the sealing material and a compound made by the Roth Rubber Company, Chicago, so that the sealing action and flexibility will not be affected by hot steam. This seal will not deteriorate in fluctuating steam temperatures and the effects of sub-zero weather when the car is standing idle.

Each metallic conduit between the cars has eight swivel joints to absorb the jolting action of moving cars. This 2¾-in. outside diameter, ⅛-in. wall thickness with a 1-in. skirt asbestos-faced seal can be utilized at each of the joints.

◆

Traction Motor For Diesel Electric

Designated as Form GE752E, a new model traction motor for diesel-electric locomotives has been announced by the General Electric Company. It includes several improvements in the present GE752.

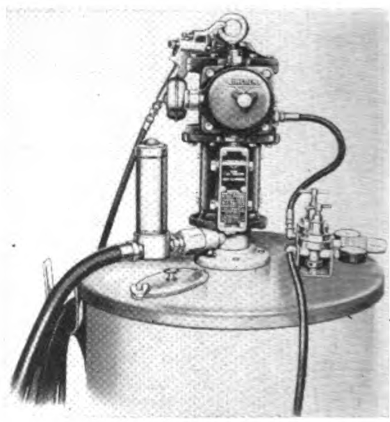


The pinion-end armature head has been redesigned to make it more sturdy and to permit easier cleaning of all armature ventilating holes. A keyless armature shaft has been used to give greater strength and to permit more accurate line-up on the commutator and armature core, a feature that simplifies commutator repairs. Improved varnish treatment of the armature gives a smoother surface which is easier to keep clean.

Triple-deck banding of the armature, which has already proved successful in service, gives added protection against damage from excessive motor speed during wheel slip. The armature bearing caps are equipped for sealed grease lubrication eliminating the need for grease fittings. This refinement eliminates the need of adding lubricants between overhauls.

Nose wear-plates are easier to apply because they are now welded instead of riveted to the brackets. Oil waste and spillage on the axle linings have been reduced by the addition of an oil return groove.

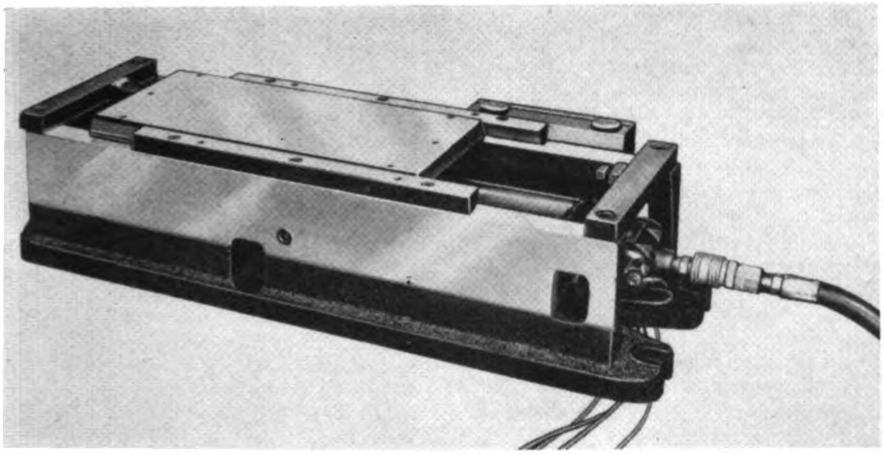
◆



Air-Operated Pumps

For automatic application of heavy to light materials, such as sealers, adhesives, roofing, waterproofing, insulating and caulking compounds, the Lincoln Engineering Co., St. Louis, Mo., has introduced a line of air-operated pumps and accessories.

A total of eleven models provide different systems for spray gun, pole gun and flo-gun applications. They are available for use with original 400 lb. and 100 lb. drums, and with a container for 5 gal. material package.



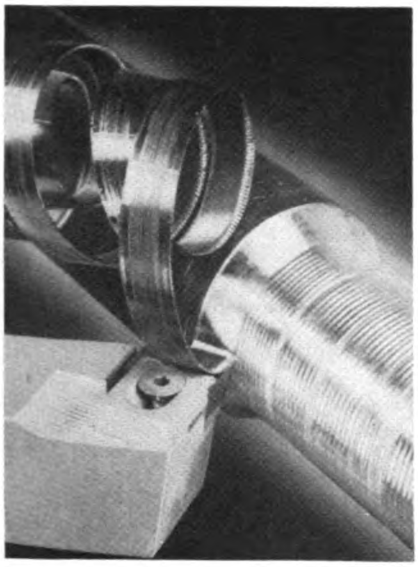
Air Powered Work Feeder

A new 2-station electrically controlled, air-powered work feeder, called the Transfeed is being added to the line of devices made by the Bellows Co., Akron 9, Ohio.

The device consists of a movable steel table top $1\frac{1}{16}$ in. thick by $5\frac{1}{4}$ in. wide by 12 in. long which is guided between dovetail ways. Power for the transverse motion of the table top is supplied by an air motor with a built-in valve.

This feeder has a 6-in. transverse positioning stroke, which allows the operator to load and unload work at one end of the table while the machining operation is taking place at the other end. The unit is equipped with adjustable positive stops.

The work feeder is a packaged unit with built-in controls. It can be operated by a push-button, foot switch, or interlocked with other Bellows devices or other machine elements. All electrical connections and switches are housed in a switch box on the side of the base casting.



Clamp-On Turning Tool

A turning tool known as "Hefti-Cut" has been designed for use in turning, facing, shaping and boring of large diameters. Cuts 1-in. deep at $\frac{3}{16}$-in. feed can be taken in S.A.E. 4140 carbon steel at 88 surface ft. per min.

The device, manufactured by The DoAll Company, Des Plaines, Ill., consists of an alloy steel shank which holds carbide blanks. A two-way blank-positioning adjustment, which includes an adjustable clamp, allows a greater portion of the blank to be used before it must be discarded because a smaller clamping area is required.

Any manufacturer's standard blanks can be used for the unit. Also available are blanks with preformed angles. Use of these blanks results in an appreciable reduction in grinding time and diamond wheel wear, according to the manufacturer.

These devices can be obtained in three offsets for various turning, facing and heavy shaping and boring operations. Each style is available in several sizes to meet requirements for lighter or heavier jobs.

◆

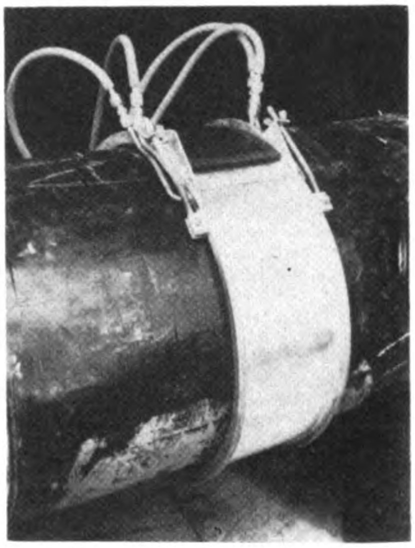
Heat Resisting Aluminum Paint

The compound Super-Hot is a ready-mixed aluminum paint that can be applied to practically any metal surface. It becomes permanently bonded to this surface when subjected to heat of from 500 to 1,600 deg. F.

Originally intended to protect metal surfaces where extreme heat is required, the product is a new development of the Sheffield Bronze Paint Corporation, Cleveland 19, Ohio. It will add a protective surface to furnaces, pipes, boilers, ovens and other metal surfaces withstanding 1,600 deg. F. The greater the heat, the more permanent the bond as the paint alloys itself to the metal surface with the application of heat.

This aluminum paint imparts a heat-resistant, anti-corrosive, weather-resistant, protective coating. It may be applied by brush, sprayed or dipped and air dries within 30 min., after which time heat can be applied. Although best results are obtained when application is made on clean, dry surfaces, the paint may be applied to finishes which are rusty, moderately greasy or oily.

◆



Hot Radiography Inspection Technique

The taking of X-ray photographs of large welded pipes, valves, and similar units at temperatures as high as 1,200 deg. F. is now possible through the technique of hot radiography, developed by Sam Tour & Co., New York 6.

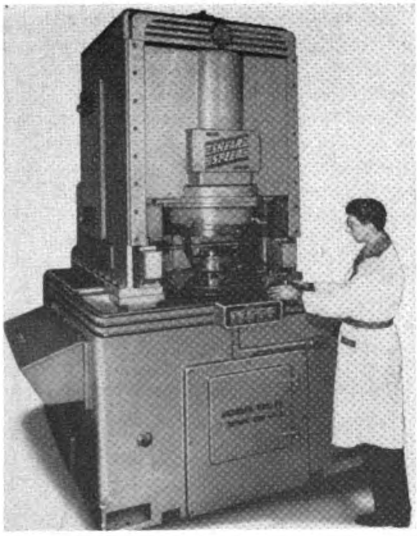
It is stated that the method eliminates several time-consuming steps necessary for the usual radio-graphic inspection techniques. Hot radiography, which can be accomplished on the hot pipe, makes it practical to interrupt the welding operation to inspect the weld root where most flaws occur. Additional time is also saved because, if defects are found, it is only necessary to chip away a partially-completed weld, rather than a finished weld.

◆

Portable Diesel-Engine Pyrometer

A portable diesel-engine pyrometer, designed for test purposes and for installations where no permanently mounted pyrometer is available, has been introduced by The Bristol Company, Waterbury 20, Conn. It is designated the model 4-321.

The thermocouples can be installed in each cylinder and in the main exhaust line. By inserting the pyrometer prongs into the corresponding receptacles in the terminal board of the thermocouple, the temperature can be checked at any time.



High Capacity Gear Shapers

Twelve new design features to provide improved performance, reduce tool change time and facilitate machine maintenance, are claimed for the Series 1800 line of Shear-Speed gear shapers, introduced by the Michigan Tool Company, Detroit 12.

The line now includes four models: 1833, 1853, 1873 and the 18105. This latter model, with a 5-in. cutter head stroke, replaces the former model 18103 which had a 3-in. maximum stroke. The models have capacities ranging from 1-in. dia. to 10-in. dia. gears with maximum face widths ranging from 2¾ in. to 4½ in. These shapers are designed for cutting spur gears, involute, angular, straight-sided and inverted splines, sliding clutches, toothed parts, ratchets and special forms.

◆

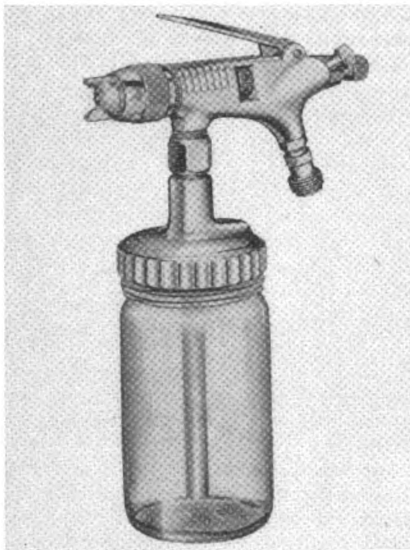
Single Phase Vertical Hollowshaft Motors

A series of single-phase hollowshaft motors, types SCU-C and SCU-R, has recently been added to the line of U. S. vertical motors, by U. S. Electrical Motors, Inc., Los Angeles 54. An improved and simpler method of disconnecting the starting capacitors has been initiated into this line of motors—namely, the accelerating type relay. Formerly a centrifugal switch, with its many moving parts and critical adjustment was used.

The relay now used gives a fast, clean contact break. The large double break contacts insure long and trouble-free life. To avoid any possibility of bearing grease working into the relay, or foreign particles being blown into the contact points by the efficient ventilating system, the relay was designed into the easily inspected, split-type box located on the side of the motor.

Available from 1½ to 5 hp., with speeds of 1,800 or 3,600 r.p.m., the SCU-C and SCU-R motors offer such features as asbestos protection of windings, Lubriflush lubrication, normalized castings, solid centricast rotor, downdraft ventilation, adjustable hollowshaft, reverse protection clutch, conservatively rated capacitors and weatherproof housing.

◆



Light Weight Spray Gun

A spray gun, designated as the Type EGA, with sensitive controls for fine spraying and suitable for small refinishing jobs, stenciling, blending and decorative work, has been introduced by the DeVilbiss Company, Toledo, Ohio. Its spray pattern can be adjusted to practically pin-point size.

Its body is an aluminum die casting. It can be used with standard glass jar fluid containers of 2, 4, 6 or 16 oz. capacity. The actuating trigger is designed for either left or right-hand operators.

◆

Double Action Hydraulic Press

A 4,000-ton upstroke double action hydraulic press, which can be operated as a single action unit by clamping the blankholder to the top platen has been perfected for railway equipment manufacture. It was designed to meet exacting require-

ments regarding platen deflections in hot-forming various car body parts and built by the Bethlehem Steel Company, Bethlehem, Pa.

In double action, it has adjustable blankholder pressure providing a range from zero to 1,000 tons. Its minimum stroke is 24 in. and maximum is 48 in.

The press has a main ram of 58 in. dia. and two smaller lifting rams and is designed to operate on a primary pressure system of 1,500 lb. per sq. in. which can be boosted to 2,250 and 3,000 lb. per sq. in. through two intensifiers. A force of 2,000, 3,000 or 4,000 tons can be exerted.

The unit has an overall height of about 33 ft., including a basement section, and will operate at a speed of 2½ pressing cycles per min.

◆

Blind Lock Bolts, Rivets And Tool for Applying

The Huck Manufacturing Company, Detroit 7, has developed a series of blind lock bolts which have been used extensively in aircraft structures where aluminum alloy blind rivets do not possess sufficient strength. They are available in ¼ in. and 5/16-in. sizes which have a single shear ultimate allowable strength of 4,990 lb. and 8,190 lb., respectively. This company also produces a series of blind rivets and lock-bolt stumps which are companion parts to the lock bolt.

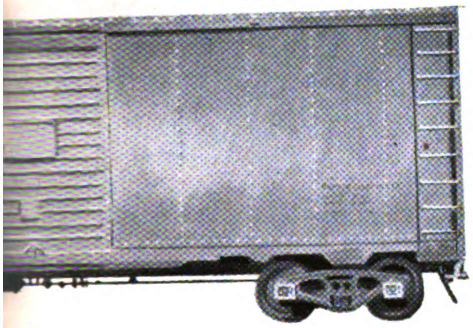
Another product, recently announced by the same company is an angle adapter designed to expand the scope of blind riveting applications to additional assembly and maintenance operations.

The device, when used with a hand riveting tool or an air riveter, is said to simplify assembly of previously inaccessible deep channels and hard-to-reach corners.

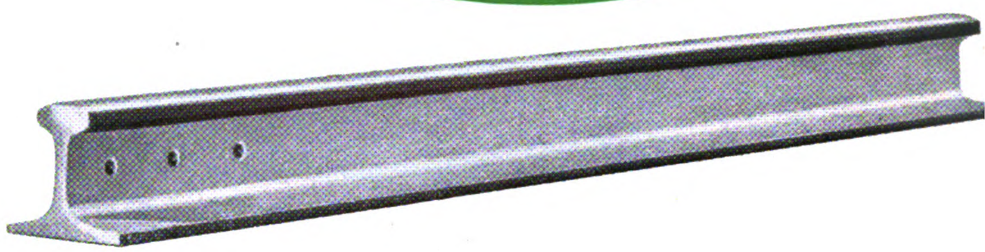
With the adapter, an operator can drive ⅛ in., 5/32 in. and 3/16 in. dia. self plugging or pull through blind rivets in a clearance space of only 4 in. from nose of riveting tool to back face of the adapter. This unit fits into a Huck No. 93 Air Riveting Tool or a No. 94 Hand Riveting Tool.

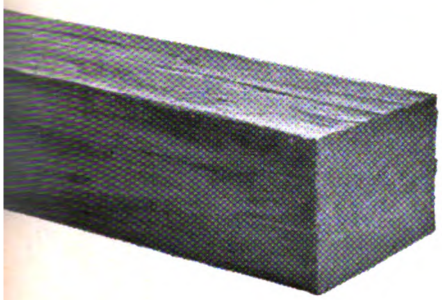
how we do it

50-ton Boxcar — UP 103%



Rails — UP 85%

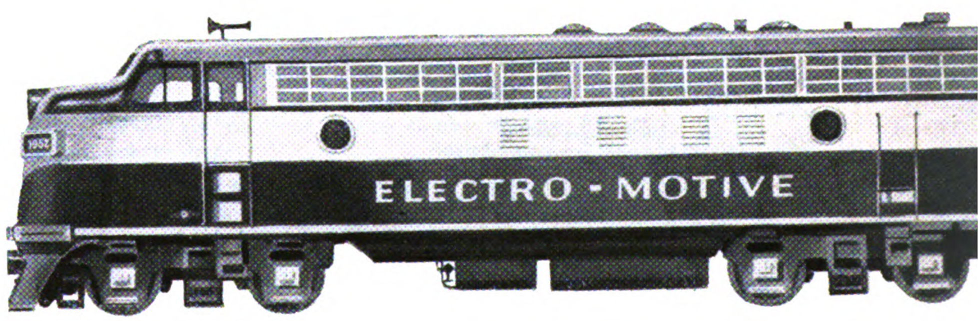




Crossties — UP 112%

BUT the price of a General Motors Diesel Unit —

UP ONLY 32%*



*—*Up only 18.8% on a horsepower basis*

better off with

GENERAL MOTORS
LOCOMOTIVES

NEWS

A.A.R. Board Approves New Research Facilities

"To enlarge facilities for an accelerated program of railroad research," the board of directors of the Association of American Railroads has authorized construction of another building at the A.A.R. Central Research Laboratory at the Illinois Institute of Technology in Chicago. This was announced by William T. Faricy, A.A.R. president, following a recent meeting of the board at Washington, D. C.

The new building will cost approximately $350,000, Mr. Faricy said, and will be located north of the present A.A.R. laboratory. It will be used primarily to house mechanical research.

The A.A.R. president explained that the newly authorized laboratory will be devoted entirely to working laboratory space, with administrative offices remaining in the present central laboratory. "The additional space will not only expand facilities vitally needed for research projects but also will speed up the tempo of present experimentation," Mr. Faricy declared.

It has been the policy of the A.A.R. also to utilize outside research organizations in conducting research. This policy will be continued. Work will also be continued in many railroad laboratories, through A.A.R. technical committees, and in the field, where tracks and rolling stock are subject to tests under operating conditions.

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

Freight Service (Data from I.C.C. M-211 and M-240)

Item No.		Month of March		3 months ended with March	
		1952	1951	1952	1951
3	Road locomotive miles (000) (M-211):				
3–05	Total steam	18,855	28,995	58,697	82,433
3–06	Total, Diesel-electric	27,221	22,032	78,158	60,967
3–07	Total, electric	821	878	2,399	2,415
3–04	Total, locomotive-miles	46,913	51,915	139,274	145,831
4	Car-miles (000,000) (M-211):				
4–03	Loaded, total	1,718	1,851	5,006	5,102
4–06	Empty, total	902	925	2,680	2,449
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6–01	Total in coal-burning steam locomotive trains	33,635	49,497	105,902	138,767
6–02	Total in oil-burning steam locomotive trains	8,549	13,373	25,332	35,450
6–03	Total in Diesel-electric locomotive trains	76,045	62,028	216,007	169,037
6–04	Total in electric locomotive trains	2,329	2,434	6,646	6,610
6–06	Total in all trains	120,605	127,374	353,983	349,939
10	Averages per train-mile (excluding light trains) (M-211):				
10–01	Locomotive-miles (principal and helper)	1.04	1.05	1.04	1.05
10–02	Loaded freight car-miles	40.30	39.60	39.60	39.00
10–03	Empty freight car-miles	21.10	19.80	21.20	18.70
10–04	Total freight car-miles (excluding caboose)	61.40	59.40	60.80	57.70
10–05	Gross ton-miles (excluding locomotive and tender)	2,824	2,724	2,799	2,675
10–06	Net ton-miles	1,310	1,263	1,303	1,253
12	Net ton-miles per loaded car-mile (M-211)	32.60	31.90	32.90	32.10
13	Car-mile ratios (M-211):				
13–03	Per cent loaded of total freight car-miles	65.60	66.70	65.10	67.60
14	Averages per train hour (M-211):				
14–01	Train miles	17.80	16.90	17.40	16.60
14–02	Gross ton-miles (excluding locomotive and tender)	49,615	45,401	48,145	43,916
14	Car-miles per freight car day (M-240):				
14–01	Serviceable	45.50	48.50	45.40	45.30
14–02	All	43.30	46.40	43.30	43.30
15	Average net ton-miles per freight car-day (M-240)	925	986	928	940
17	Per cent of home cars of total freight cars on the line (M-240)	42.50	35.80	41.30	34.90
	Passenger Service (Data from I.C.C. M-213)				
3	Road motive-power miles (000):				
3–05	Steam	7,591	11,404	23,803	34,299
3–06	Diesel-electric	18,367	16,189	53,662	46,231
3–07	Electric	1,675	1,706	4,973	4,851
3–04	Total	27,637	29,300	82,446	85,311
4	Passenger-train car-miles (000):				
4–08	Total in all locomotive-propelled trains	273,823	285,378	816,254	821,015
4–09	Total in coal-burning steam locomotive trains	39,594	60,888	126,502	181,791
4–10	Total in oil-burning steam locomotive trains	26,224	34,533	78,381	101,872
4–11	Total in Diesel-electric locomotive trains	189,061	171,356	555,948	485,680
12	Total car-miles per train-miles	9.74	9.60	9.73	9.51
1	Freight yard switching locomotive-hours (000):				
	Yard Service (Data from I.C.C. M-215)				
1	Freight yard switching locomotive-hours (000):				
1–01	Steam, coal-burning	909	1,406	2,865	4,088
1–02	Steam, oil-burning	174	263	514	740
1–03	Diesel-electric[1]	3,234	3,036	9,520	8,557
1–06	Total	4,340	4,732	12,971	13,465
2	Passenger yard switching hours (000):				
2–01	Steam, coal-burning	33	54	104	161
2–02	Steam, oil-burning	12	14	36	41
2–03	Diesel-electric[1]	258	250	767	712
2–06	Total	337	354	1,008	1,014
3	Hours per yard locomotive-day:				
3–01	Steam	7.00	8.40	7.40	8.40
3–02	Diesel-electric	16.80	18.20	16.90	17.80
3–05	Serviceable	14.40	14.90	14.60	14.70
3–06	All locomotives (serviceable, unserviceable and stored)	12.50	12.90	12.70	12.70
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.74	1.76	1.79	1.82
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.76	0.77	0.77	0.77

[1] Excludes B and trailing A units.

Coordinated Association Programs

The three-day meeting of the Coordinated Mechanical Associations and the Electrical Section, A. A. R. Mechanical and Engineering Divisions will be held this year September 15, 16 and 17 in Chicago. The mechanical associations are the Air Brake, Master Boiler Makers', Car Department Officers', Fuel and Traveling Engineers' and the Locomotive Maintenance Officers'. The meetings of four of these associations and those of the Electrical Section will be held at the Hotel Sherman and one mechanical association will meet at the La Salle Hotel. There will be an exhibit of electrical products at the Hotel Sherman under the auspices of the Railway Electric Supply Manufacturers' Association. The afternoon of Tuesday, September 16 will be set aside for the inspection of the exhibits by attending members.

The officers of the coordinating committee of the Coordinated Mechanical Associations which consist of the presidents and secretaries of the railway associations and the exhibiting organization are: Chairman, J. P. Morris, general manager, mechanical department AT&SF; vice-chairman, F. K. Mitchell, manager equipment, New York Central system, and secretary, C. F. Weil, American Brake Shoe Company. W. E. Lynch, General Electric Company, is president of Railway Electric Supply Manufacturers' Association and J. C. McPrice (Allen-Bradley Company) is secretary-treasurer.

The programs of the several associations appear below. Central Daylight Saving Time is shown on all programs.

Air Brake Association

Monday, September 15

10 a.m.

Address by President K. E. Carey.

Secretary's report.

Proper procedure of repairing and Handling Air Brake Equipment—Central Air Brake Club.

To Create, by Association, a Closer Interest of Air-Brake Men, by G. W. Misner, Westinghouse Air Brake Company.

Methods of Measuring System Leakage—St. Louis Air Brake Club.

2 P.M.

Freight and Passenger-Train Handling and Dynamic Braking, T. H. Bickerstaff (chairman), supervisor air brakes, Atchison, Topeka & Santa Fe. (Joint session with R.F. & T.E.A.)

TUESDAY, SEPTEMBER 16

9 A.M.

Address—J. W. Hawthorne, general superintendent motive power and equipment, Atlantic Coast Line.

Air Leakage on the Individual Car, by Martin Alger, Jr., New York Air Brake Company.

Standardization of Air-Brake Equipment for Diesel and Turbo-Electric Locomotives, C. E. Miller (chairman), supervisor air brakes and steam heat equipment, New York Central System.

Report Approved Maintenance Practice Committee, F. W. Dell (chairman), Grand Trunk Western.

The Release Control Retainer as a Means for Better Braking—Manhattan Air Brake Club.

WEDNESDAY, SEPTEMBER 17

9 A.M.

The Brake Cylinder Release Valve, by L. A. Stanton, general air-brake instructor, Great Northern.

Maintenance and Repairs of Diesel Locomotive Air Compressors—Pittsburgh Air Brake Club.

Symposium on Automatic Freight-Car Slack Adjusters.

2 P.M.

Completion of papers and discussion of committee reports.

Election of officers.

Unfinished business.

ORDERS AND INQUIRIES PLACED FOR NEW EQUIPMENT SINCE THE CLOSING OF THE JULY ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horse-power*	*Service*	*Builder*
Bessemer & Lake Erie	10A[1]	1,500	Road	Electro-Motive
	8B[1]	1,500	Road	Electro-Motive
	3[1]	1,500	Road switch	Electro-Motive
	2[1]	1,600	Switch	Baldwin-Lima-Hamilton
	2	1,000	Switch	Alco-G.E.
Central of Georgia	15[2]	1,600	Road switch	Alco-G.E.
Chesapeake & Ohio	12[3]	1,500	Freight	Electro-Motive
	2[3]	1,200	Yard switch	Electro-Motive
	29[3]	1,500	Road switch	Electro-Motive
Chicago, Burlington & Quincy	6[4]	2,250	Passenger	Electro-Motive
	17[4]	1,500	Road switch	Electro-Motive
	8[4]	1,500	Road switch	Electro-Motive
Great Northern	1A[5]	1,500	F-7	Electro-Motive
	1B[5]	1,500	F-7	Electro-Motive
New York, Chicago & St. Louis	10	1,500	Road switch	Electro-Motive
	10	1,000	Yard switch	Alco-G.E.
	5	1,200	Yard switch	Fairbanks, Morse
International Harvester Co.	4[6]	800	Switch	Electro-Motive
	2[6]	1,200	Switch	Electro-Motive
St. Louis-Southwestern	8	1,600[7]	Road switch	Alco-G.E.
	4A	1,500[7]	Freight	Electro-Motive
Seaboard Air Line	5A	2,250[8]	Passenger	Electro-Motive
	25	1,500[8]	Road switch	Electro-Motive
	10	1,600[8]	Road switch	Alco-G.E.
	10	1,000[8]	Yard switch	Alco-G.E.
	10	1,200[8]	Switch	Baldwin-Lima-Hamilton

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Apalachicola Northern	100[9]	Pulpwood	Pullman-Standard
Bangor & Aroostook	250	Insulated refrigerators	Pacific Car & Fdry.
	250	Insulated box	Pacific Car & Fdry.
Gulf, Mobile & Ohio	50[10]	70-ton covered hopper	Pullman-Standard
Minneapolis, St. Paul & Sault Ste. Marie	400[11]	50-ton box	Company shops
Toronto, Hamilton & Buffalo	300[12]	50-ton box	National Steel Car
Transportation Corps	204	80-ton flat	Pressed Steel
	386	40-ton tank	American Car & Fdry.

[1] Deliveries of A and B 1,500 units now being made. Delivery of three 1,500 road switchers expected in September. Delivery of remaining units expected during August.

[2] Delivery expected during August. Approximate cost, $2,300,000.

[3] Delivery of the 12 1,500 freight units scheduled for November. These will be made up into four locomotives costing $503,600 each. Delivery of the yard switchers scheduled for January. To cost $105,900 each Eighteen of the road switchers scheduled for delivery in January and 11 in February. Twenty-four will cost $162,665 each; three, $153,325 each, and the remaining two, $152,460 each.

[4] Delivery expected late this year.

[5] These two units will comprise one locomotive. Delivery expected late in August. Approximate cost, $335,000.

[6] Chicago, West Pullman & Southern, an International Harvester subsidiary, has requested I.C.C. authority to lease the six units from its parent company.

[7] Seven of the 1,600 hp. units are for freight service; the eighth, for passenger service. Delivery expected in October. The A units are scheduled for September delivery.

[8] Delivery of the A passenger units expected in December and of the 25 road switchers, during the fall. Five of the 1,600-hp. road switching units are to be equipped for passenger service. Delivery of the 10 road switchers and the 10 yard switchers expected during the fall and through January 1953. Delivery of the 10 1,200 switchers expected during the last quarter of 1952.

[9] Delivery expected early in 1953. Approximate cost, $750,000.

[10] Delivery scheduled for the first quarter of 1953.

[11] Estimated cost, $2,340,000. Delivery scheduled for late next year.

[12] Approximate cost, $2,300,000. Delivery scheduled for April 1953

Master Boiler Makers' Association

MONDAY, SEPTEMBER 15

10 A.M.

Address—President Harry C. Haviland.

Report of Executive Board.

Financial report.

Secretary-Treasurer's report.

2 P.M.

Address—William C. Wardwell, superintendent equipment, New York Central System.

Report on Topic No. 2—Study and recommendations for water tanks on diesel locomotives to better facilitate inspection and washing. S. E. Christopherson (chairman), retired supervisor of boiler inspection and maintenance, New York, New Haven & Hartford.

Report on Topic No. 1—Study of the advantages and disadvantages of steam heat plants, A. E. DeForest (chairman), assistant to superintendent of equipment, Michigan Central.

TUESDAY, SEPTEMBER 16

9:30 A.M.

Report of Committee on Law.

Address—E. H. Davidson, director, Bureau of Locomotive Inspection, I.C.C.

Report on Topic No. 3—Study and recommendations on method of staying side sheets and crown sheets with view to eliminate threading holes, F. E. Milligan (chairman), general boiler inspector, Canadian Pacific.

Election of officers.

WEDNESDAY, SEPTEMBER 17

9:30 A.M.

Report of Executive Board.

Address—C. T. DeWitt, superintendent of safety, Northern Pacific.

Report on Topic No. 4—Study and recommendations for the welding and brazing of diesel locomotive and tender parts, Joseph Michne (chairman), welding instructor, New York Central.

History, Progress and Development in the Manufacture and Repair of Locomotive Boilers and Tenders, by C. B. Peck, editor, Railway Mechanical and Electrical Engineer.

Water treatment as presented and discussed by the Master Boiler Makers' Association during the past 50 years, by Carl A. Harper, general boiler inspector, Cleveland, Cincinnati, Chicago & St. Louis.

2 P.M.

Report of Committee on Memorials.

Report on Topic No. 5—What can the boiler supervisors do to better educate themselves for positions other than boiler supervisor, F. E. Godwin (chairman), system chief boiler inspector, Canadian National.

1953 meeting topics.

Report of Committee on Resolutions.

Locomotive Maintenance Officers Association

MONDAY, SEPTEMBER 15

10:30 A.M.

Apprentice Training—Committee on Diesel Personnel Training, E. V. Myers (chairman), superintendent motive power, St. Louis-Southwestern.

Thirty-Five Years of Progress in the Enforcement and Observance of Laws Intended to Improve the Safety and Efficiency of Railway Operation, by W. J. Patterson, member, Interstate Commerce Commission.

2 P.M.

Committee Report—Oil Leaks, Crankshaft and Bearing Failures, J. W. Luke

ESSO COBLAX

"Tailor-made" to railroad specifications

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Esso

The Symbol of SERVICE

RAILROAD PRODUCTS

SOLD IN: Maine, N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Penna., Del., Md., D. C., Va., W. Va., N. C., S. C., Tenn., Ark., La.

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ESSO COBLAX LUBRICANTS

have been specifically developed to provide highly dependable gear lubrication for traction motor drives on electric and diesel-electric locomotives; gas electric and multiple-unit cars; and many other locomotive and car lubrication requirements. Esso COBLAX is available in a wide range from fluid oils to semi-solid products... "tailor-made" for railroad applications.

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— keeping pace with latest engine design and developments. Esso Railroad Products are constantly being tested and improved.

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— on-the-job check ups by Esso Sales Engineers assure dependable performance of Esso Railroad fuels and lubricants! Be sure to call on ESSO for any fuel or lubricating problem.

SUMMARY OF MONTHLY HOT BOX REPORTS

Month	Foreign and system freight car mileage (total)	Cars set off between division terminals account hot boxes: System	Foreign	Total	Miles per hot box car set off between division terminals
July, 1950	2,745,932,894	....	.....	23,957	114,619
August, 1950	2,937,455,020	7,422	15,490	22,912	128,206
September, 1950	2,974,297,739	6,541	12,881	19,422	153,141
October, 1950	3,165,997,915	4,343	8,935	13,278	238,439
November, 1950	2,868,871,913	2,536	5,331	7,867	364,672
December, 1950	2,813,042,212	2,278	5,968	8,246	341,140
January, 1951	2,840,847,511	2,870	8,436	11,306	251,269
February, 1951	2,425,226,454	4,528	14,063	18,591	130,452
March, 1951	3,063,173,942	3,667	10,078	13,745	222,857
April, 1951	2,996,562,763	3,702	8,914	12,616	237,521
May, 1951	3,013,634,782	5,631	13,737	19,368	155,599
June, 1951	2,874,873,495	7,074	15,376	22,450	128,057
July, 1951	2,768,920,095	8,886	18,823	27,709	99,929
August, 1951	3,009,371,111	9,023	19,092	28,115	107,038
September, 1951	2,925,570,545	6,472	13,565	20,037	146,008
October, 1951	3,116,490,095	4,131	9,053	13,184	236,384
November, 1951	2,939,503,144	2,022	4,405	6,427	457,368
December, 1951	2,752,316,133	2,130	5,398	7,528	365,611
January, 1952	2,824,298,630	3,208	7,197	10,405	271,437
February, 1952	2'809,162,671	6,473	6,473	9,196	305,477
March, 1952	2,943,812,727	2,594	5,877	8,471	347,517

(chairman), general supervisor diesel engines, Atchison, Topeka & Santa Fe.

Committee Report—Possibilities of Diesel Parts Reclamation, F. Thomas (chairman), assistant to general superintendent equipment—diesel and electric, New York Central System.

TUESDAY, SEPTEMBER 16

9 A.M.

Committee Report — Standardization, Control and Distribution of Tools for Diesel Work—F. E. Molloy (chairman), superintendent motive power, Southern Pacific.

12 P.M.

Presidents' Luncheon—Speaker—J. P. Kiley, president, Chicago, Milwaukee, St. Paul & Pacific.

WEDNESDAY, SEPTEMBER 17

9 A.M.

Committee Report—Diesel Locomotive Cleaning; Improving Productivity of Steam Locomotives—C. H. Spence (chairman), superintendent shops, Baltimore & Ohio.

Committee Report—Determination of Diesel Facilities—H. E. Niksch (chairman), superintendent motive power and equipment, Elgin, Joliet & Eastern.

2:15 P.M.

Committee Report—Wheel Slip Detection—F. Thomas (chairman), assistant to general superintendent equipment—diesel and electric, New York Central System.

Team Work—A Safety Essential, by E. H. Davidson, director, Bureau of Locomotive Inspection, I.C.C.

Committee Report—Flashovers, Cause and Prevention—W. P. Miller (chairman), assistant to chief mechanical officer, Chicago & North Western.

Railway Fuel and Traveling Engineers' Association

MONDAY, SEPTEMBER 15

10 A.M.

Address—President R. H. Francis.

Secretary's report.

Water Treatment Steam and Diesel Locomotives, G. E. Anderson (chairman), general fuel supervisor, Great Northern.

Improvement and Efficiency in the Use of Coal for Steam Locomotives, C. R. Patterson (chairman), fuel supervisor, Canadian National.

Excitation System Alco-G.E. Diesel Locomotives (with slides), R. D. Nicholson (chairman), general road foreman engines, New York, New Haven & Hartford.

2 P.M.

Passenger-Train Handling; Freight-Train Handling; Dynamic Braking, T. H. Bickerstaff (chairman), supervisor air brakes, Atchison, Topeka & Santa Fe. (Joint session with Air Brake Association.)

TUESDAY, SEPTEMBER 16

9 A.M.

Definition of Specifications for Diesel Fuel Oil, T. L. Henley (chairman), chief fuel supervisor, Missouri-Kansas-Texas.

Use of Diesel Fuel Oil and Loss of Fuel, T. L. Henley (chairman), chief fuel supervisor, Missouri-Kansas-Texas.

Steam Generators — Trouble Shooting, etc., W. H. Fortney (chairman), chief road foreman engines, Cleveland, Cincinnati, Chicago & St. Louis.

Safety on Railroads and Proper Observance of Signals, by H. P. Hamilton, St. Louis-San Francisco.

Diesel Operation, Including Improper Handling of Locomotives, R. R. Rich (chairman), road foreman of equipment, Chicago, Rock Island & Pacific.

Train Delays Caused by Diesel Failures —Cause and Remedies, T. J. Conway (chairman), fuel supervisor, Texas & Pacific.

Employee and Public Relations, by L. C. Porter, vice-president (operating), Texas & Pacific.

WEDNESDAY, SEPTEMBER 17

9 A.M.

Safety Precautions on Diesel Locomotives, R. D. Nicholson (chairman), general road foreman engines, New York, New Haven & Hartford.

Importance of Making Proper Reports, etc., by Edward H. Davidson, director, Bureau of Locomotive Inspection, I.C.C.

Tracing Schematic Wiring Diagrams of EM Model F-7, E-8, GP-7 Diesel-Electric Locomotives (with slides), F. G. LaMaster (chairman), system fuel supervisor, Chicago, Burlington & Quincy.

Prevention of Loss and Damage and Personal Injuries Due to Rough Handling, G. B. Curtis (chairman), road foreman of engines, Richmond, Fredericksburg & Potomac.

2 P.M.

Results of Election.

Air Pollution and Smoke Abatement, M. G. Stewart (chairman), road foreman of engines, Washington Terminal Co.

Education of Road Supervision and Engine Crews, R. H. Francis (chairman), general road foreman equipment, St. Louis-San Francisco.

Car Department Officers' Association

MONDAY, SEPTEMBER 15

10 A.M.

Address—President W. N. Messimer, general superintendent equipment, Merchants Despatch Transportation Corporation.

Address by A. E. Wright, president and general manager, Manufacturers Railway and St. Louis Refrigerator Car Company.

Report of Committee on Interchange and Billing for Car Repairs, J. J. Sheehan (chairman), supervisor car repair bills, Missouri Pacific.

2 P.M.

Report of Committee on Air-Conditioning Equipment—Operations and Maintenance, R. F. Dougherty (chairman), general electrical and air conditioning inspector, Union Pacific.

Report of Committee on A.A.R. Loading Rules, A. C. Bender (chairman), joint supervisor car inspection, Cleveland Car Inspection Association.

TUESDAY, SEPTEMBER 16

9 A.M.

Report of Committee on Inspection, Conditioning and Repairing Cars for Higher Commodity Classification, T. E. Hart, chief car inspector, New York, Chicago & St. Louis.

Comments by C. A. Naffziger, director, National Freight Loss and Damage Prevention Section, Association of American Railroads.

Report of Committee on Car Lubrication, K. H. Carpenter, superintendent car department, Delaware, Lackawanna & Western.

Comments by W. M. Keller, director mechanical research, Association of American Railroads.

WEDNESDAY, SEPTEMBER 17

9 A.M.

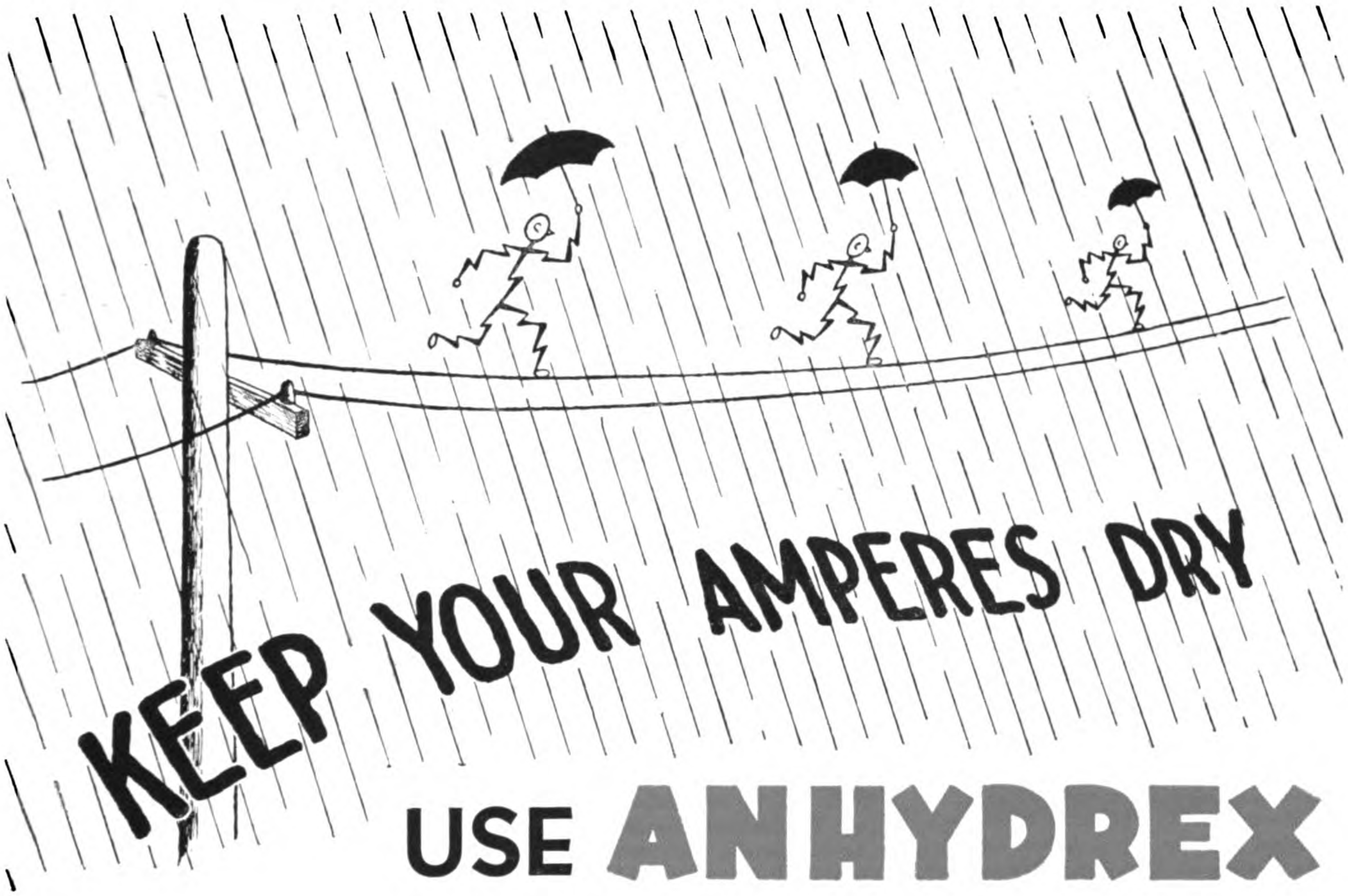
Report of Committee on Analysis of Train Yard Operation, W. B. Medill, master car repairer, Southern Pacific.

Report of Committee on Wheel-Shop Practices, E. W. Kline, general wheel shop foreman, Baltimore & Ohio.

Report of Committee on Painting—Some Aspects of Railway Equipment Maintenance, F. M. Vogel, painter formean, Denver & Rio Grande Western.

Miscellaneous reports.

Election of officers.



Water in some form or other causes more interference with satisfactory cable service than any other one thing. Even small amounts of moisture finding their way into cables can put important power circuits out of business.

Cables in ducts are nearly always exposed to water. Even aerial cables can suffer from water. That is why you should use ANHYDREX cables to keep your amperes dry. With Simplex Anhydrex rubber insulation you need not use a lead sheath. ANHYDREX cables will function satisfactorily even under the wettest conditions.

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SIMPLEX ANHYDREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

Electrical Section of the Engineering and Mechanical Divisions, A.A.R.

MONDAY, SEPTEMBER 15

10 A.M.

Address by H. F. Finnemore (chairman, Electrical Section), chief electrical engineer, Canadian National.

Business session.

Election of officers.

Discussion committee reports on: Wire, Cable and Insulating Materials, C. R. Troop (chairman), assistant engineer, New York Central System.

Electrolysis, H. P. Wright (chairman), assistant electrical engineer, Baltimore & Ohio.

Application of Corrosion-Resisting Materials to Railway Electrical Construction, S. R. Negley (chairman), electrical engineer, Reading.

Power Supply, C. P. Trueax (chairman), assistant electrical engineer, Illinois Central.

2 P.M.

Special reports on New Orleans Union Passenger Terminal, by C. J. Wallace, manager, New Orleans Union Passenger Terminal, and J. M. Trissal, assistant chief engineer, Illinois Central.

Discussion committee reports on: Electric Heating, C. A. Williamson (chairman), electrical engineer, Texas & New Orleans.

Application of Radio and Communicating Systems to Rolling Stock, W. S. Heath (chairman), electrical assistant, Atchison, Topeka & Santa Fe.

TUESDAY, SEPTEMBER 16

9 A.M.

Business session.

Discussion committee reports on: Illumination, L. S. Billau (chairman), electrical engineer, Baltimore & Ohio.

Wiring Diagrams for Rolling Stock, E. J. Feasey (chairman), general supervisor of diesel equipment, Canadian National.

Car Electrical Equipment, S. B. Pennell (chairman), assistant engineer, New York Central System.

Welding and Cutting, L. E. Grant (chairman), engineer of tests, Chicago, Milwaukee, St. Paul & Pacific.

12 NOON

Joint luncheon with Railway Electric Supply Manufacturers' Association and Allied Railway Supply Association. Speaker, J. P. Kiley, president, Chicago, Milwaukee, St. Paul & Pacific.

WEDNESDAY, SEPTEMBER 17

9 A.M.

Discussion committee reports on: Car Air Conditioning Equipment, A. E. Voight (chairman), car-lighting and air-conditioning engineer, Atchison, Topeka & Santa Fe.

Electrical Facilities and Practices for Repair Shops.

1:45 P.M.

Committee on Automotive and Electric Rolling Stock, C. A. Wilson (chairman), general supervisor diesel engines, Atchison, Topeka & Santa Fe. (Joint session with Locomotive Maintenance Officers' Association.)

N.P.A. To Drop Unit Production Controls

Unit production controls governing output of freight cars and locomotives will be eliminated by the National Production Authority, effective with respect to materials allocated in this year's fourth quarter for production during the first quarter of 1953.

N.P.A. announced this at recent meetings of its advisory committees which represent the car and locomotive builders. At their previous meetings, the committees had recommended elimination of the unit controls which fix the number of cars and locomotives to be produced out of each quarter's allocations of controlled materials. The meetings of the committees were held during the week of June 28, at which time the N.P.A. also met with the advisory committee representing manufacturers of component parts. The Locomotive Builders' Industry Advisory Committee told the N.P.A. that "if the steel strike continues much longer, the nation's railroad equipment industry will be laid 'flat on its back' late in July or early in August." The Railroad Contract Car Builders' Industry Advisory Committee said that some shops have already been shut down and that others will be immobilized by the end of July. Trouble confronts the railroad Freight Car Component parts manufacturers' industry unless steel production is resumed very soon.

N.P.A. officials predicted that the elimination of unit controls would result in "greater flexibility" of car and locomotive production schedules. They emphasized, however, that allocations of material will continue to be made to the railroad industry as at present and that the end of unit control does not mean that any more material will be available.

Recommendations made at July 8 meetings of the Railroad Advisory Committee of the N.P.A. proposed that "available material for the construction of freight cars and locomotives be allocated in accordance with the condition of order boards." Railroad officers who constitute the committee members were of the opinion that N.P.A.'s practice of allocating material to companies without orders results in production of fewer units than if all available material were allocated against existing orders. The N.P.A. representatives at the meeting, however, were reported to have said that the proposed plan would require all orders to be booked about nine months in advance and might greatly injure some railroads and freight-car and locomotive builders.

Meanwhile, the railroad committee recommended that fourth quarter allotment tickets be issued under the Controlled Material Plan just as though no steel strike were in progress because they believe that such a plan will make it possible to obtain steel more quickly after the strike is settled. On the other hand, the N.P.A. representatives were of the opinion that the struck mills will need two weeks for rescheduling their orders before new orders can be accepted.

According to the American Iron and Steel Institute in its release of Monday, July 21, at the end of the second full week of July over 16,250,000 tons of steel will have been lost in the controversy with the steel workers, including the shutdowns in late April and early May as well as the eight-week interval which began on June 2.

Miscellaneous Publications

SPRAY PAINTING MADE EASY. Published by DeVilbiss Company, 300 Phillips avenue, Toledo 1. Cost, 35 cents. Booklet includes short cuts and hints for spray-painting; job set-ups; sections on furniture, walls and woodwork spraying, and metal finishing, and a material guide covering various finishing materials used in the spray application. Special section gives quick data on 62 different types of spray jobs.

◆

I.C.S. INSTRUCTION TEXTS ON ELECTRICAL EQUIPMENT OF DIESELS.—International Correspondence Schools, Scranton, Pa. Two new instruction texts on the Electrical Equipment of Diesel Locomotives have been added to I.C.S. courses in Diesel Locomotives. The texts were written by Harold K. Lanning, mechanical research engineer of the Atchison, Topeka & Santa Fe, and are available both to individual students and to companies using the I.C.S. Selective Plan under which employers select only those subjects which are required to achieve a specific training objective for certain key personnel. Part 1 covers systems of power transmission, motor requirements, characteristics of traction motors, motor cooling and rating, current-voltage-speed relations, field shunting, dynamic braking, commutation, mechanical and electrical construction, and maintenance. Part 2 deals with factors influencing generator design, current range of generator and motor, power circuits, commutation and mechanical features of generators.

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT	RPM Delo R.R. Oil
UNIT	Locomotive diesel engines
SERVICE	Freight and passenger
OPERATION	Local and transcontinental
MAINTENANCE	Progressive

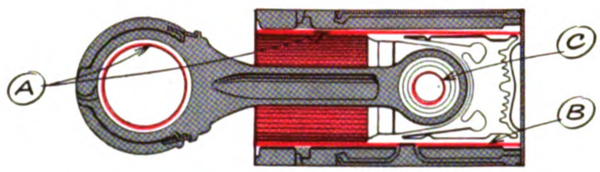
One million miles of service from engine parts!

LUBRICATED WITH RPM DELO R.R. OIL, many diesel engines in the locomotives of U.S. railroads have been in service for long periods without complete overhaul! Many of the liners, pistons, bushings and other parts in these engines have now been in use for hundreds of thousands of miles. Progressive maintenance inspections indicate that RPM DELO R.R. Oil will keep the parts in service for at least one million miles, the general overhaul period set by some of the railroads.

RPM DELO R.R. Oil keeps parts clean and free of wear-causing lacquer and gum deposits and is not corrosive to engine metals of any kind.

IN OVERLAND MOUNTAINOUS FREIGHT SERVICE for nearly 500,000 miles, this liner, lubricated with RPM DELO R.R. Oil has less than 0.006 inch wear and taper is so minor that it is barely measurable.

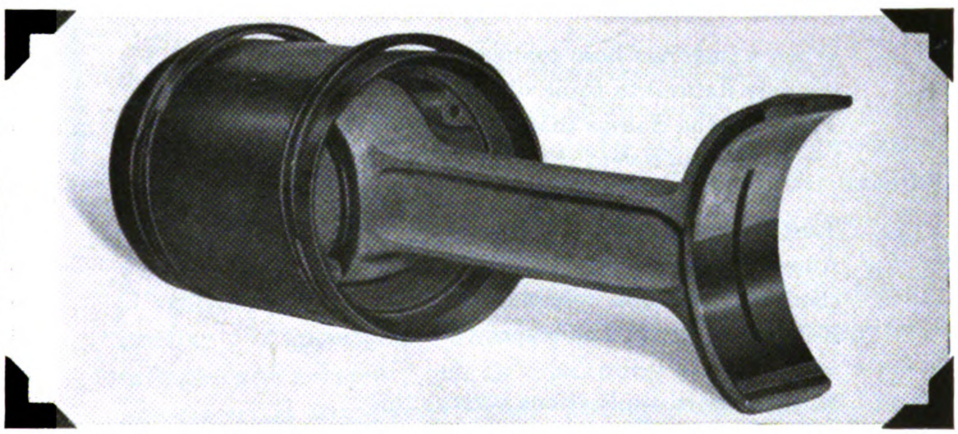
How RPM DELO R.R. Oil prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.



THIS PISTON AND CONNECTING ROD have been in service for more than four years. After picture was taken it was put back in the engine for further use. Note the excellent condition of the rings and bearing. All the rings are free, oil holes open and there are no troublesome deposits in any ring grooves.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any one of the companies listed below.

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P.O. Box 862 • El Paso, Texas

SUPPLY TRADE NOTES

PENNSYLVANIA SALT MANUFACTURING COMPANY.—*John E. Hawley* has joined the Research and Development Division of Pennsalt at the Whitemarsh Research Laboratories, Wyndmoor, Pa. Mr. Hawley's duties in the Maintenance Chemicals Department will involve the development of cleaning compounds for the transportation industry. Mr. Hawley was previously on the engineer of tests staff of the Baltimore & Ohio.


J. E. Hawley

◆

AMERICAN CAR & FOUNDRY CO.—*Robert G. Brossard* has been appointed sales agent in the New York District office of American Car & Foundry. Mr. Brossard, who was formerly located in Cleveland, will report to Thomas C. Ballou, district sales manager.


R. G. Brossard

Mr. Brossard is a graduate of Washington University, St. Louis (1936) with an AB degree. He joined ACF's Cleveland sales office in 1944, handling railroad and miscellaneous sales.

◆

UNITED STATES STEEL CORPORATION.—*Keith P. Rindfleisch*, Chicago district manager of the United States Steel Supply di-

vision of U. S. Steel, has been appointed sales vice-president. *H. P. Kibbey*, assistant district manager at Chicago, succeeds Mr. Rindfleisch.

◆

UNION ASBESTOS & RUBBER CO.—*Robert M. Covert* has been appointed eastern district sales manager—railroad sales, for the Union Asbestos & Rubber Co., with headquarters in New York. Mr. Covert is the former district sales manager at Chicago, where he covered Chicago and the north midwest.

◆

WESTINGHOUSE AIR BRAKE COMPANY.—The following appointments have been made in the Air Brake Division of the company: At New York—*C. O. DeWitt*, assistant manager of the eastern district, and *R. B. Morris*, eastern district engineer. At Chicago—*J. G. Rees*, representative, western district, and *D. G. Blaine*, representative.

Mr. DeWitt, a graduate of Case School of Applied Science, has been with the company since 1926, serving on the engineering staff at Wilmerding until his transfer to the New York Office in 1930 as assistant to the district engineer. He was appointed district engineer in 1941.

C. O. DeWitt

Mr. Morris, previously assistant district engineer, has served on the eastern district engineering staff since 1941 when he was

R. B. Morris

assigned to Philadelphia as engineer. He is a graduate of Pennsylvania State College. He joined Westinghouse Air Brake immediately after graduation in 1937, serving on the engineering staff in Wilmerding.

Mr. Rees became associated with Westinghouse Air Brake upon graduating from Cornell University in 1946. He worked in

J. G. Rees

the Wilmerding engineering department before assignment to Chicago, where he has been service engineer since February, 1948

Mr. Blaine, a graduate of Purdue University, joined the engineering staff at

D. G. Blaine

Wilmerding in 1941. He served in the commercial engineering division at the home office and moved to Chicago in 1947 as service engineer.

◆

General Motors Corporation.—*Milton H. Gardner*, general repair sales manager, has been appointed assistant general sales manager of the *Electro-Motive Division* of General Motors. *G. C. Mikelson*, a sales engineer, has been appointed sales representative in the Chicago Region.

Mr. Gardner, whose promotion follows consolidation of the commercial selling activities within the sales department with rebuilding of locomotive components being joined with new locomotive sales activities, has been with Electro-Motive since February 1938 when he became associated with the organization as a service engineer. Prior to joining Electro-Motive he had 10 years' service with the Chicago, Burlington

& Quincy, much of it in gas-electric rail car and diesel locomotive maintenance and operation. After holding various positions in the service department of Electro-Motive, Mr. Gardner became St. Louis regional service manager on July 1, 1946. In April

M. H. Gardner

1948 he was appointed district sales manager, St. Louis region; a year later, general repair manager at La Grange, and early in 1951 general repair sales manager.

Mr. Mikelson became associated with Electro-Motive on January 4, 1939. He became a personnel instructor in the service department in May 1943, and a senior in-

G. C. Mikelson

structor in the same department three years later. On April 1, 1949, Mr. Mikelson was appointed a service engineer; on October 1, 1950, district engineer, and on February 16, 1951, sales engineer.

◆

Spring Packing Corporation. — A graphic demonstration of how moisture condensation inside railroad box cars may be safely controlled with no damage to lading provides the main theme for a 15-min. color film "The Story of Dednox," recently released by the Spring Packing Corporation. The film, written and produced by the Telepix Corporation, Hollywood, is an actual scene-by-scene dramatization of a typical railroad claims-loss cause due to moisture condensation during shipment. Condensation causes, effects, and preventive measures through spraying of Dednox are visually explained. Animated treatments point up highlights of the theme. Koda-

chrome prints in 16 mm are available to railroad groups on a free-loan basis by writing George L. Green, Spring Packing Corporation, 332 South Michigan avenue, Chicago 4.

◆

AIR-MAZE CORPORATION.—*Richard E. Brown* has been appointed chief engineer at Cleveland, Ohio.

Mr. Brown, a graduate of Case Institute

R. E. Brown

of Technology with a degree in mechanical engineering, has been with Air Maze during the past ten years as development engineer and more recently has been assistant chief engineer.

◆

NATIONAL ELECTRIC PRODUCTS CORPORATION.—*C. Wesley Merritt* has been appointed sales manager of the newly organized railroad department of the National

C. W. Merritt

Electric Products Corporation, Pittsburgh. Mr. Merritt will coordinate sales of wires, cables, conduits, raceways and accessories for installation in railroad rolling stock and diesel maintenance shops.

Mr. Merritt, graduate in electrical engineering of the University of Pittsburgh (1921), has been with National Electric since 1940. He has most recently been engineer of wires and cables.

◆

SHERWIN-WILLIAMS COMPANY.—*Arthur H. Burt* has been appointed director of sales for the Sherwin-Williams Company, with headquarters in Cleveland. Mr. Burt has spent his entire business career with Sherwin-Williams. In 1946 he was appointed director of the north central sales re-

gion, also with headquarters in Cleveland, in which capacity he was serving at the time of his new appointment.

◆

General Steel Castings Corporation.—*Howard F. Park, Jr.*, whose appointment as manager of sales for the General Steel Castings Corporation was announced in the July issue became associated with General Steel Castings in 1942, after several years with the Western Electric Company and the Budd Company. Mr. Park was in charge of the purchasing department until 1945, when he became assistant to vice-the southeast and middle Atlantic states.

Howard F. Park, Jr.

president—sales. Later he was appointed assistant district manager of the eastern sales office, and in 1950, district manager—sales.

Lawrence P. White, whose appointment as district manager—sales, at the eastern district sales office, also was announced in the July issue, joined General Steel Castings in 1946 as a special apprentice and

Lawrence P. White

progressed through various departments of the company in a training program. He entered the sales department in 1947 and in 1950 became manager of foreign sales.

◆

Bogue Electric Manufacturing Company.—*Macdonald Goodwin* has been appointed regional sales manager of the railway equipment division of the Bogue Electric Manufacturing Company, with headquarters at Washington, D. C. Mr. Goodwin will represent the firm to railroads in *C. Earl Healey* has been appointed staff assistant to the president of the division and *Sylvain Garnett* has been appointed staff assistant to John A. Herbst, vice-president in charge of engineering for Bogue Electric. Mr. Healey and Mr. Herbst will maintain headquarters at the general offices in Paterson, N. J. *Clayton R. Kielich* has been appointed systems engineer in the engineering department at Paterson.

◆

Joseph T. Ryerson & Son.—*Weaver E. Falberg*, assistant manager of the alloy-steel division of Joseph T. Ryerson & Son, has been appointed manager of the division, to succeed *John W. Queen*, who has been given special administrative duties while awaiting re-assignment in the organization.

◆

McDougall-Butler Company.—*Justin A. Shook* has been appointed to the McDougall-Butler sales staff for Washington, D. C. and vicinity.

◆

Mosebach Electric & Supply Co.—The majority stock of the Mosebach Electric & Supply Co., Pittsburgh, has been acquired by *R. Hampton* and *L. H. Hampton*, concurrently with the resignation of *Mrs. Karl*

J. Mosebach, co-founder of the firm, as treasurer and chairman of the board after 27 years of service. *R. Hampton,* president, has announced that the company is expanding the number of items manufactured for railroads, mines and mills. The new products will include various types of signal rail bonds, resistors and associated electrical items for railroads and overhead trolley systems.

◆

Camel Sales Company.—*W. A. Beauchamp,* mechanical engineer for the Camel Sales Company, has been elected vice-president, engineering and research. *Gabriel Madland* succeeds Mr. Beauchamp as mechanical engineer.

◆

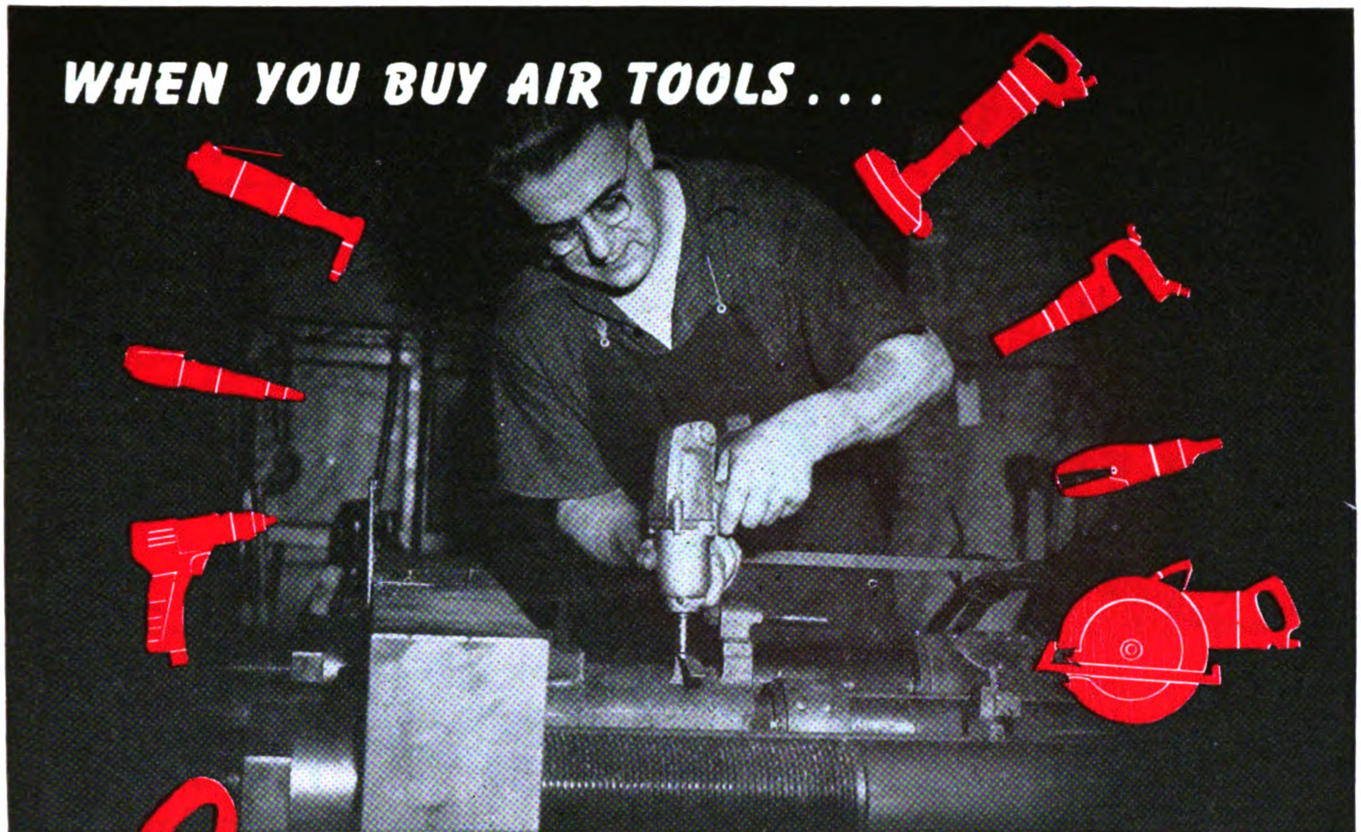
Dayton Rubber Company.—*E. K. Lofton* has been appointed sales manager of the Dayton Rubber Company's railway and agricultural original equipment manufacturers', divisions. Mr. Lofton, who was formerly regional sales manager of the central region of the mechanical division, has been with the company since 1934. He will have headquarters in the company's main plant, Dayton, Ohio, and will be assisted by *E. F. Leherissey* as manager of field sales of the railway division, with headquarters in the company's Chicago offices.

E. K. Lofton

E. F. Leherissey

◆

Georgia-Pacific Plywood Company.—*Willis L. Campbell* has been appointed



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vice-president and assistant to the president of the Georgia-Pacific Plywood Company. Mr. Campbell formerly was vice-president and treasurer of the General Insurance Company of America at Seattle.

◆

Youngstown Sheet & Tube Co.—*David W. Martin* has been appointed district sales manager, in charge of the Atlanta, Ga., office.

Obituary

Donald R. Royal, special representative of the railway service division of Oakite Products, Inc., at Atlanta, Ga., died recently in Memphis, Tenn. Before joining the Oakite organization in 1948 Mr. Royal was general foreman of the locomotive department of the Illinois Central at Centralia, Ill.

◆

William Walton Ford, district sales manager for the Youngstown Sheet & Tube Co. at Atlanta, Ga., for the past 24 years, died on June 11, in an Atlanta hospital.

Personal Mention

Atlantic Coast Line

G. R. Gibbs appointed general diesel supervisor, with headquarters at Jacksonville, Fla.

H. G. Swanson appointed roundhouse foreman at Rocky Mount, N. C.

W. S. Funderburg appointed assistant enginehouse foreman at Rocky Mount, N. C.

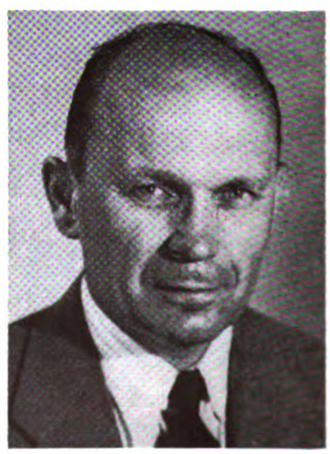
Canadian National

J. D. Sylvester, assistant electrical engineer, appointed electrical engineer at Montreal.

Born: Star, Alta.

Education: University of Alberta (B.S. in E.E., 1938).

Career: Became an engineering draftsman for the CNR at Montreal in 1939, and in 1942 was appointed assistant electrical engineer.



J. D. Sylvester

P. H. Bell, mechanical superintendent for the Oshawa Railway Company, appointed mechanical and electrical superintendent, Niagara, St. Catharines & Toronto, with headquarters at St. Catharines, Ont.

W. E. Danter, superintendent car equipment at Montreal, appointed assistant general superintendent of car equipment, with headquarters at Moncton, N. B.

A. D. MacPherson, controller of tests and materials research laboratory, has retired after 34 years of service.

J. J. Miller, mechanical and electrical superintendent, Niagara, St. Catharines & Toronto, appointed electrical superintendent, St. Clair Tunnel, with headquarters at Port Huron, Mich.

H. J. Betts, electrical engineer (equipment) at Montreal, appointed electrical engineer, central region, with headquarters at Toronto.

A. D. Rowe, locomotive foreman, St. John's, N.F., enginehouse, appointed general foreman in the locomotive shops at St. John's.

C. E. Skene, road foreman of engines at Winnipeg, Man., appointed road foreman of engines, Port Arthur division.

F. Haldane, road foreman of engines, Port Arthur division, appointed master mechanic, Edmonton division.

S. A. Beveridge, assistant foreman, Toronto, Ont., enginehouse, appointed district boiler inspector, with headquarters at Toronto.

Chicago, Burlington & Quincy

F. R. Hosack, general superintendent motive power at Chicago, appointed general superintendent car department.

F. J. Schleihs, master mechanic at Des Moines, appointed general superintendent for motive power, with headquarters at Chicago.

Chesapeake & Ohio

F. E. Lawrence appointed road foreman of engines at Charlottesville, Va.

M. E. Sandridge appointed assistant road foreman at Charlottesville, Va.

Chicago, Milwaukee, St. Paul & Pacific

F. A. Upton, master mechanic at Western avenue, Chicago, appointed assistant superintendent of motive power, with headquarters at Milwaukee.

R. E. Magnuson, assistant master mechanic at Western avenue, Chicago, appointed master mechanic at Western avenue.

W. W. Bates, as master mechanic, has jurisdiction over the Milwaukee First and Third districts, with headquarters at Milwaukee.

F. L. King, master mechanic at Milwaukee, has had jurisdiction extended to in-

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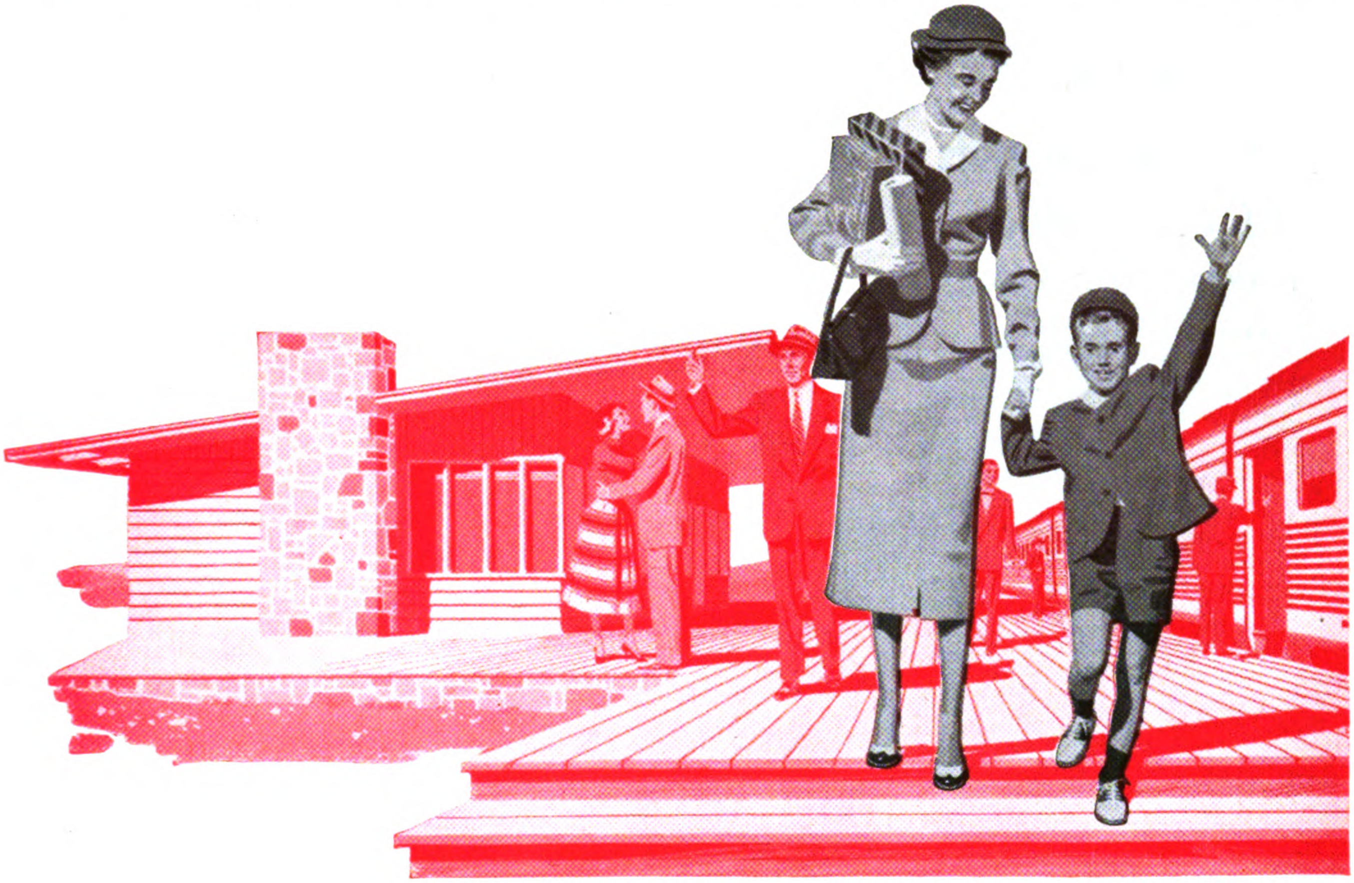

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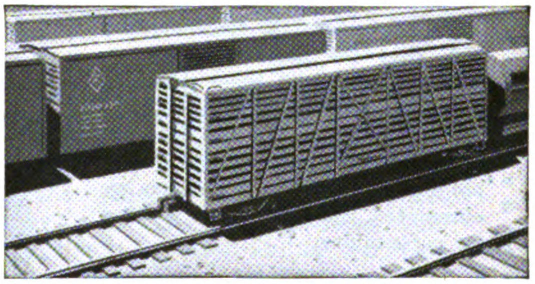

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CHLOROPHENOL

clude Second district of the Milwaukee Division and the First and Second districts of the Madison Division.

H. C. POTTSMITH appointed assistant master mechanic of La Crosse and River Division, with headquarters at La Crosse, Wis.

T. J. KUBAL appointed assistant master mechanic of the Madison Division First and Second districts, with headquarters at Milwaukee.

P. J. LUCAS appointed assistant to general road foreman of engines, with headquarters at Milwaukee.

Erie

Charles Frederick Schwartz

CHARLES F. SCHWARTS appointed general master mechanic at Jersey City as announced in July issue.

Born: April 28, 1895, at Hornell, N. Y.

Career: Became machinist apprentice in Erie shops at Hornell, N. Y., on June 21, 1910. Subsequently served as a machinist at Hornell and Galion, Ohio; fitting shop foreman at Galion; foreman at Meadville; assistant general foreman at Hornell, and general foreman at Secaucus, N. J. Appointed master mechanic at Avoca, Pa., in March 1944; general foreman at Hornell in December 1945; master mechanic at Avoca in January 1946; shop superintendent at Hornell in September 1947, and master mechanic at Jersey City in April 1950.

Missouri-Kansas-Texas

CLAY W. LEWIS, JR., chief chemist, test and inspection department, appointed engineer of tests at Parsons, Kan.

EARL V. SEIFERT, car and locomotive draftsman, appointed assistant engineer of tests (a newly created position).

New York Central

L. S. RANDOLPH appointed supervisor of locomotive performance, with headquarters at Buffalo.

H. J. SCHOLZ appointed road foreman of engines at Detroit.

KENNETH J. ICKES appointed assistant road foreman of engines at Jackson, Mich.

Norfolk & Western

J. L. BARRY, master mechanic, Scioto division, with headquarters at Portsmouth, Ohio, has retired.

H. B. ROBINSON, assistant master mechanic, Scioto division, appointed master mechanic of the division, with headquarters at Portsmouth, Ohio.

Northern Pacific

FRED O. YOUNG, mechanical engineer at St. Paul, has retired after 46 years of service.

H. E. BRAKKE, assistant to mechanical engineer, appointed mechanical engineer at St. Paul.

E. C. ESTES appointed assistant to mechanical engineer at St. Paul.

Rutland

LAWRENCE RICHARDSON elected president at Rutland, Vt.

Born: Shelbyville, Ky., on July 11, 1889.

Education: Cornell University (M.E., 1910) and University of Illinois (1908-1909).

Career: Entered railroad service in 1907 as a regular apprentice with the Pennsylvania at Altoona and was with the PRR mechanical department for 10 years. In 1926 became assistant to the chairman of the executive committee, Boston & Maine, and later served successively as assistant to president, mechanical superintendent, chief mechanical officer and mechanical assistant to vice-president and general manager. In 1947, appointed mechanical consultant of the B&M and the Maine Central, also assistant general manager of the New York, Susquehanna & Western. In September 1951 joined the Rutland as consultant in the operating and mechanical departments.

Lawrence Richardson

Pennsylvania

W. L. THIGPEN, JR., assistant foreman, Paoli, Pa., car shop, appointed assistant foreman, Sunnyside, L. I., car department.

J. K. McNEAL, gang foreman, Crestline, Pa., enginehouse, appointed assistant foreman, Paoli, Pa., car shop.

J. E. RICHEY, assistant foreman, Mingo Junction, Pa., car shop, Panhandle division, appointed assistant foreman, Pittsburgh passenger yard, Pittsburgh division.

G. W. CONNER, gang foreman, Derry car shop, Pittsburgh division, appointed assistant foreman, Mingo Junction car shop, Panhandle division.

J. S. HARRIS, enginehouse foreman, Long Island Railroad, appointed assistant foreman, Pitcairn, Pa., enginehouse, Pittsburgh division.

E. R. HALL, gang foreman, Columbus, Ohio, Columbus division, appointed assistant foreman, Canton enginehouse, Eastern division.

R. ZECHLIN, assistant foreman, Clayton, enginehouse, appointed foreman, Atlantic City, N. J., enginehouse.

Pennsylvania *(Continued)*

J. W. JACKSON, assistant foreman, Sunnyside, L. I., car yard, appointed assistant foreman, Clayton, enginehouse.

J. W. MCLAREN, gang foreman, 28th street enginehouse, Pittsburgh, appointed assistant foreman, Sunnyside, L. I., car yard.

D. S. MCCRACKEN, assistant foreman, Harrisburg diesel shop, appointed enginehouse foreman, Meadows, N. J.

W. E. LUDDY, JR., assistant foreman, first trick. Harrisburg diesel shop, appointed assistant foreman, third trick, Harrisburg diesel shop.

J. W. MCGUIGAN, assistant foreman, Sunnyside, L. I., car department, appointed assistant foreman, first trick, Harrisburg diesel shop.

Seaboard Air Line

L. A. MCCOOK appointed general supervisor car department at Jacksonville, Fla.

Southern

HARVEY E. SOWERS appointed foreman car repairs at Spencer, N. C.

JAMES W. ALLEN appointed foreman electricians at Spencer, N. C.

DENNIS E. HANES appointed assistant foreman enginehouse at Spencer, N. C.

JOHN H. SLOAN appointed foreman electricians, Hayne car shop, Spartanburg, S. C.

GEORGE I. PARRISH appointed foreman enginehouse (night) at Danville, Va.

EDGAR C. CORNWELL, JR., appointed road foreman of engines, Charlotte division, with headquarters at Spencer, N. C.

VERNON G. FAISON appointed road foreman of engines at Spencer, N. C.

Obituary

ALONZO G. TRUMBULL, retired chief mechanical engineer, Advisory Mechanical Committee of the Chesapeake & Ohio, the New York, Chicago & St. Louis, the Erie and the Pere Marquette at Cleveland, died on May 27.

Born: Hornell, N. Y.

Education: Cornell University, 1899 (M.E.)

Career: Entered railroad service in 1902 as engineer of tests of the Erie. In 1903, appointed mechanical engineer; 1905, assistant mechanical superintendent at Meadville, Pa.; 1907, successively, assistant mechanical superintendent, Ohio division, and mechanical superintendent, Ohio division

A. G. Trumbull

and Chicago & Erie; 1912, mechanical superintendent, Erie division; 1914, assistant to general mechanical superintendent; 1919, assistant general mechanical superintendent; 1920, mechanical superintendent, Ohio Region; 1922, chief mechanical engineer, Erie at New York, and 1929, chief mechanical engineer, Advisory Mechanical Committee with headquarters at Cleveland, Ohio. Appointed general mechanical engineer of the Chesapeake & Ohio, the Pere Marquette, and the New York, Chicago & St. Louis in 1945.

Associations: Mechanical Division, A.A.R. (In 1920 chairman of Committee on Modernization of Stationary Boiler Plants and from 1925 to 1928 chairman of Tank Car Committee. Member of the American Society of Mechanical Engineers. (On the Executive Committee of the Railroad Division from 1928 to 1933.)

—ADVERTISERS IN THIS ISSUE—

(Continued on page 130)

—ADVERTISERS IN THIS ISSUE—

Ignitron electric locomotive with each cab supported on six-wheel trucks

Ignitron Locomotives Turn in Good Performance Records

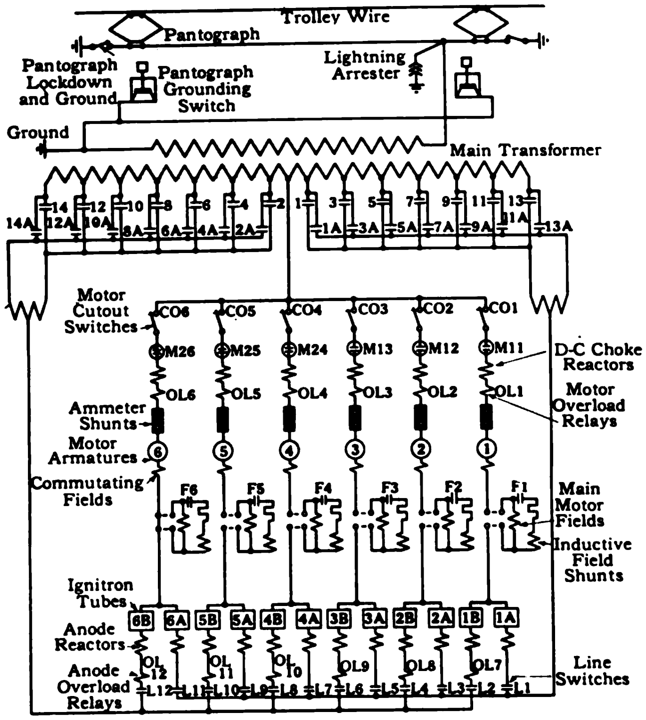
In service on the Pennsylvania, the Ignitron locomotive hauled 400,440 ton-miles per train running hour as compared with 163,905 for a type GG1 electric and 122,679 for a P52 electric locomotive

By C. C. Whittaker and W. M. Hutchison
Transportation Engineers
Westinghouse Electric Corporation

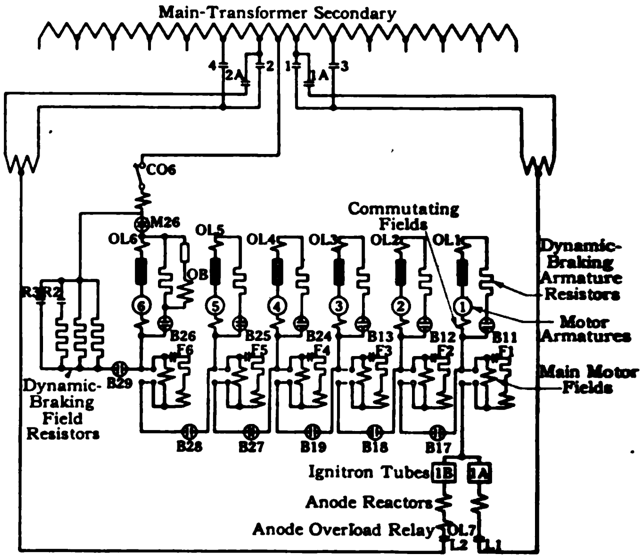
One day last November, a shiny new electric locomotive eased out of the Pennsylvania railroad yards at Enola, Pa. Nothing about its appearance distinguished it significantly from other locomotives of the Pennsylvania electrification. Actually, it is unlike any of its predecessors. It is the first Ignitron rectifier locomotive, and, as such, establishes another milestone in railroading. In its first big test, operating in regular revenue service, the rectifier locomotive has proved to be everything expected of it. But, in addition to providing significant advantages in present-day service, the Ignitron locomotive may have an important effect on future railroad electrification.

A few months after the first Ignitron locomotive went into service, a second similar one joined it. These two locomotives have rolled up a combined total of 60,000 miles of service and have proved eminently satisfactory in the tough freight service between Harrisburg, Pa., and the east coast.

The Ignitron locomotive represents a completely new principle of electric locomotive operation. Single-phase a.c. power from the overhead trolley is rectified by means of sealed Ignitron tubes, and the d.c. output of the rectifier is supplied to series-wound, d.c. traction motors that drive the locomotive. Thus, the economies possible with an a.c. trolley system and the tractive advantages of d.c. motors are combined in the same locomotive.



Connection of apparatus in one unit during motoring. Accelerating taps on each side of the transformer center tap feed an anode bus that supplies six Ignitron tubes. Each pair of tubes furnishes full-wave rectified power to one d.c. traction motor. The circuit is completed from each motor through a d.c. choke reactor that limits voltage ripple to 30 per cent, a motor switch, a cutout switch, and back to the transformer center tap. All six traction motors in each unit are connected in parallel. By means of phase delay on some notches, 35 notches for motoring are provided on the controller



Circuit connections for dynamic braking. Fourteen braking steps are available

Both the d.c. and a.c. systems have advantages. Low-voltage d.c. traction motors inherently cost less They also require less maintenance. The a.c. series commutator motor, although it serves its purpose well, has always had high first cost and high maintenance expense. This is because the a.c. motor requires a low operating voltage and, therefore, high current, which results in a longer commutator and more brushes per brush-holder. Also, the a.c. motor is essentially a low-flux-per-pole motor. Therefore, it has more poles than a corresponding d.c. motor, and proportionately more brush-holders. It requires a revolving brush-holder yoke and a complicated system of main and interpole field shunts and relays that have proved expensive in first cost and maintenance, especially since a failure of these devices usually carries with it a motor failure. Consequently, the d.c. series motor is preferable. On the other hand, a high-voltage a.c. trolley system reduces transmission losses and lowers first cost of electrification in comparison with d.c. transmission. Although some 1,500- and 3,000-volt d.c. systems are used, most railroad electrifications in this country use a single-phase a.c. power.

To prove that the modern Ignitron was suitable for railway service, a multiple-unit car for commuter service on the Pennsylvania was so equipped. It has given excellent, trouble-free service since 1949. The performance of that car was so successful that development, and acceptance by the Pennsylvania, of an Ignitron freight locomotive soon followed.

Although the rectifier principle as applied to locomotive service is new, the apparatus is new only in this combination and for this purpose. Each component has been proved through long service. With the exception of the rectifier and associated circuits, the apparatus on the Ignitron locomotive is similar to that on other electric locomotives.

Each of the locomotives develops 6,000 hp. in two units. This is equivalent in rail horsepower to a 7,300-hp. diesel locomotive, since diesel ratings are based on net horsepower delivered by the diesel engine to the generators. Each unit is rated at 3,000 rail horsepower and is driven through six axles by six 500-hp. d.c. traction motors.

Unusual Truck Arrangements

The mechanical parts on these Ignitron locomotives are similar in many respects to diesel-electric locomotive units, with the exception of the trucks. On one locomotive, each cab is mounted on three two-axle trucks. The other locomotive has more conventional three-axle trucks. This was done to prove by actual experience which type is more satisfactory.

On the locomotive with three-axle trucks, each cab is supported at three points on each truck; the center pin, located between the first two axles, and the two spring-loaded side bearing pads between the second and third axles. The center pin bearing is carried on a bolster supported from the truck frame by swing-links and springs. The side bearing pads are mounted directly on the frame.

The two-axle truck arrangement consists of three trucks per cab. This is an entirely new design for six-axle, total-adhesion (all axles driven) locomotives. The advantages include simplicity and standardization of truck design, greatly improved tracking qualities, better accessibility to motors, and improved motor ventilation.

On the new design, the center truck is free to move laterally without restraint. This and extremely soft springs and "no-lift" lateral-motion devices prevents weight shift from truck to truck when the locomotive negotiates curves or vertical irregularities in the track. The lateral motion of the end trucks is spring restrained and thus absorbs the lateral shocks that occur on curves and irregular tangent track.

When the locomotive passes over any vertical rise in the track, the center truck tends to take more of the load, but, because of the soft springs, the increase in

Two-unit Ignitron locomotive with a 2 (B-B-B) wheel arrangement

load is small and does not greatly affect the axle-to-axle load distribution. The suspension springs, being soft, have a large deflection (7½ in.) when loaded and any incremental increase in deflection causes only a small additional increase in axle load.

Another unique feature of the two-axle truck design is that the entire cab weight is carried by the side-bearing pads. The center pin serves only as a swivel bearing and to transmit the tractive force; it is hollow and is used to transmit cooling air to the motors, with a significant improvement in motor ventilation.

Running tests up to the present have shown excellent riding qualities for the three-truck locomotive cab, even at top speed on relatively rough track. Tests on the second locomotive having two three-axle trucks are not yet very extensive, but indications are that the tracking qualities will not equal the performance of the first.

Operating Experience

Any new equipment, particularly that embodying such a radical departure from existing equipment as the Ignitron locomotive, must result in significant improvements in operation and performance to gain widespread acceptance. And the proof of the performance comes when the equipment is placed in service under actual operating conditions.

During the first 60,000 miles of revenue service on the Pennsylvania, the first two Ignitron locomotives have given excellent service.

Arc-backs within the Ignitron tube, as described in a previous article (March 1952 issue of *Railway Mechanical and Electrical Engineer*), presented the greatest possibility for trouble. This is encountered in some stationary installations of Ignitron tubes, and was one of the reasons

TABLE I—PERFORMANCE OF ELECTRIC FREIGHT LOCOMOTIVES IN ROAD TESTS FROM ENOLA TO MORRISVILLE, PA. (130 MILES)

Locomotive Data	Class GG1	Class P5a	Class E2C
Type	a.c.	a.c.	a.c. to d.c.
Number of cabs	1	1	2
Continuous rail horsepower	4,620	3,750	6,000
Maximum speed (m.p.h.)	90	70	63
Total weight (lb.)	460,000	394,000	740,900
Weight on drivers (lb.)	300,000	229,000	740,900
Overall length (ft.)	79.5	62.7	124
Present tonnage ratings, Enola to Morrisville, Pa.			
Adjusted tons (factor =20)	6,000	6,300	16,800
Flat tons, 50-ton cars	4,280	4,500	12,000
Flat tons, 85-ton cars	4,850	5,100	13,600
Road Tests			
Date	Aug.23,1946	Aug.14,1946	Feb.19,1952
Rail condition	dry	dry	dry
Number of cars	76	80	162
Adjusted tons	5,895	6,158	16,588
Flat tons	4,375	4,558	13,348
Per cent of rating	98.2	97.7	98.3
Time in motion	3 hr. 28 min.	4 hr. 50 min.	4 hr. 20 min.
Average speed (m.p.h.)	37.4	26.8	30
Gross ton miles	568,750	592,540	1,735,240
Gross ton miles per train running hour	163,905	122,679	400,440

for the failure of an earlier rectifier railway car operated on the New Haven in 1914. This trouble has not been encountered either on the multiple-unit car or on the two locomotives.

A large number of notches are provided so that, during acceleration, the increase in tractive force between notches is small. This minimizes the possibility of slipping the wheels when the controller is advanced. As a result, a heavy train can be started very smoothly and without imposing excessive stress on draw bars.

The tremendous pulling power of the Ignitron locomotive was spectacularly demonstrated last February. A

(*Continued on page 74*)

General view of the Louisville, Ky. diesel-electric shop

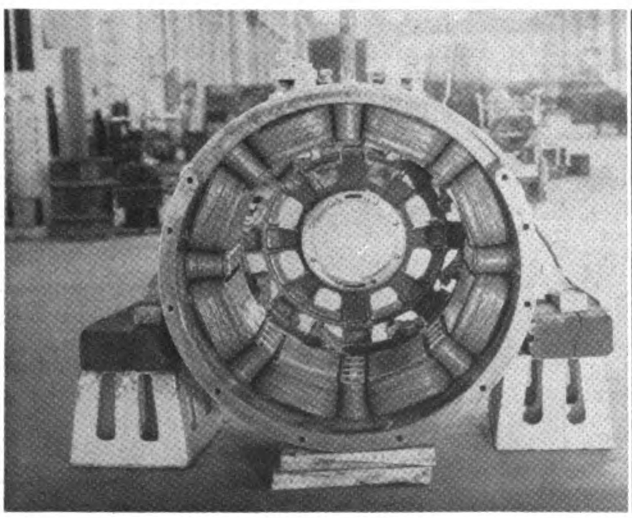
Louisville & Nashville Expands Its Electric Shop

Although the shop is still in the process of organization, is has already developed excellent methods and facilities for diesel electrical maintenance

THE Louisville & Nashville moved its diesel electrical maintenance facilities into its present quarters at Louisville, Ky., in December, 1951, and the shop is still in the process of being equipped. The floor area now being used is 98 ft. wide, by 220 ft. long. The road now has 357 diesel locomotive units in operation, with 55 more on order.

The shop has the usual complement of equipment such as balancing machines, degreaser, baking ovens, impregnator, banding machine, lathe, drill press, etc. It is notable for devices and methods used to facilitate work.

Lower left: Fig. 1—Generator field ready for reassembly. Lower right: Fig. 2—A field coil from which the leads have been removed and replaced by busbars



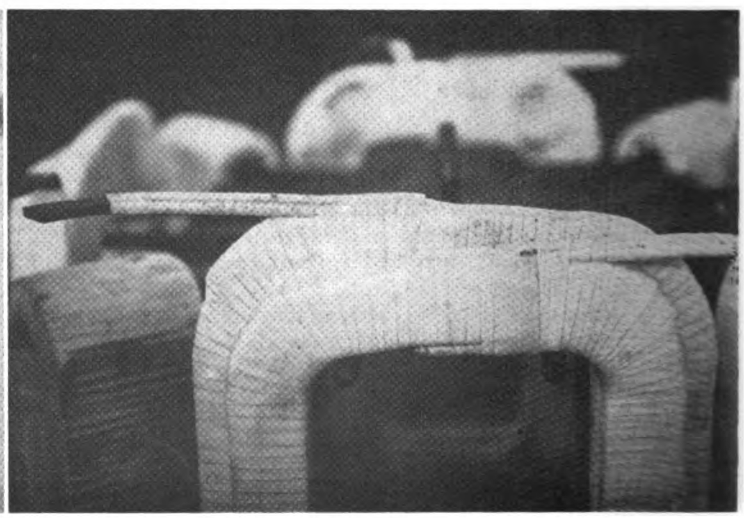
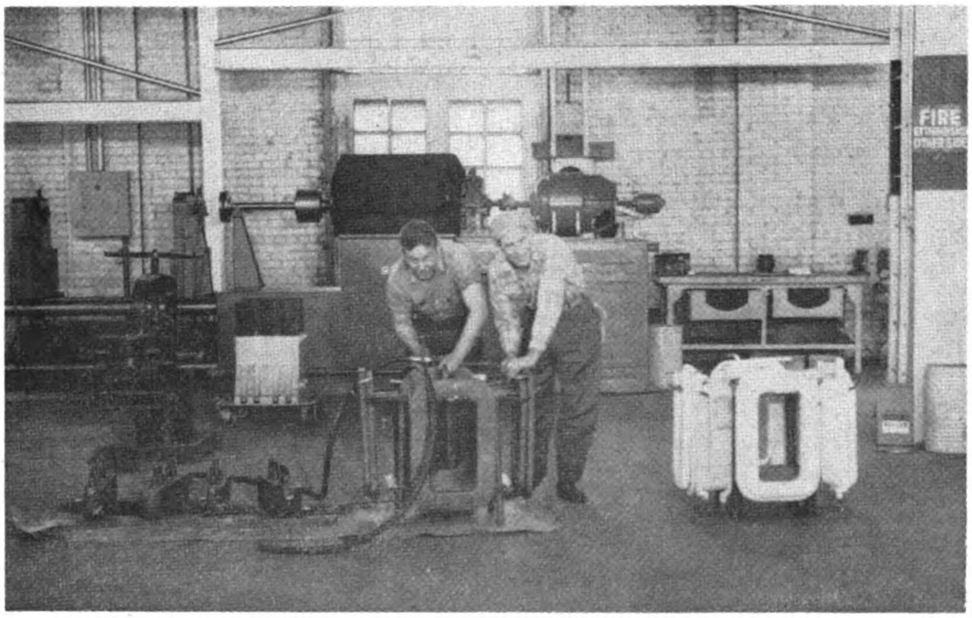
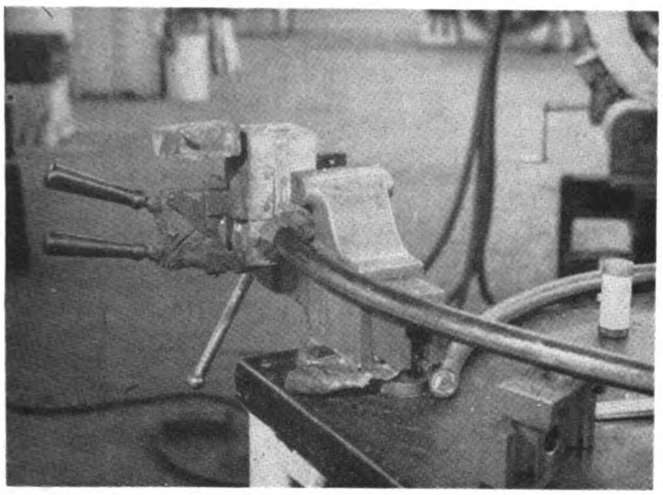


Fig. 3—Special racks are used for putting reinsulated motor field coils through the impregnator



Below: Fig. 4—Cable and terminal in a Cadweld carbon mold ready for welding. A cartridge of the welding reagent is shown at the right



Some of these are shown in the accompanying illustrations.

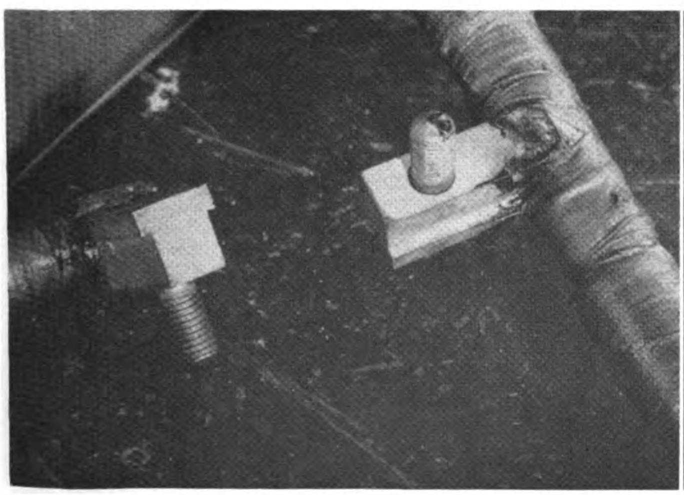
Generator fields, as shown in Fig. 1, are impregnated with coils in place. The first operation consists of cleaning the field in the degreaser for ten minutes, after which it is blown out with air. Then it is baked overnight at 250 deg. F., after which it is put through the impregnator. When the frame comes out of the impregnator, all machine fits are wiped clean with varnish solvent. Masking paint has been tried to cover the fits while the field is in the impregnator, but it has been the experience of this shop that it is just as difficult to peel off masking paint as to wipe off impregnating varnish with solvent. After the machine fits are cleaned, the field is returned to the oven where it is baked for 24 hours at 300 deg. F. The final operation consists of spraying the coils and connections with Du Pont Filmflex fast drying red varnish.

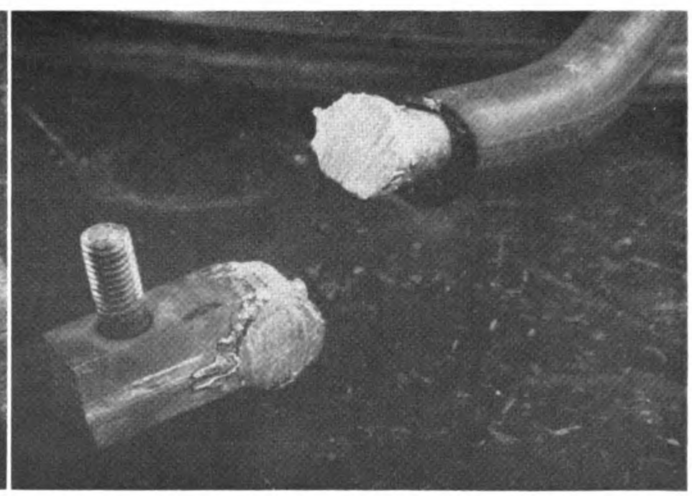
Traction motor field coils will also be impregnated with coils in place when an oven, now on order, is installed.

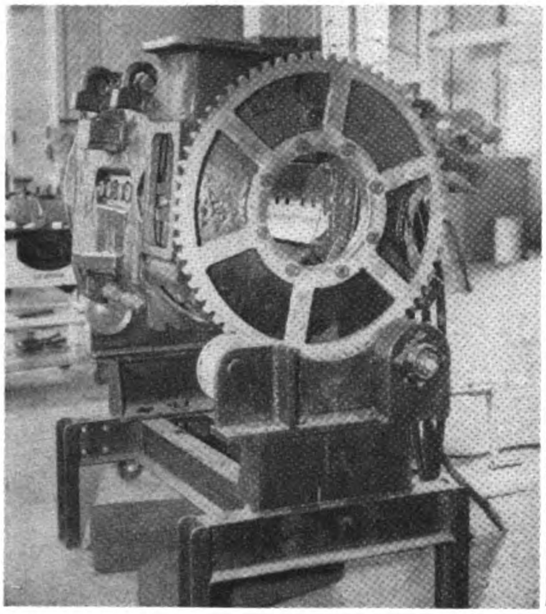
When necessary to remove or retap E.M.D. type D7 motor field coils, the flexible leads are removed, and busbar connections are made to the coil ends.

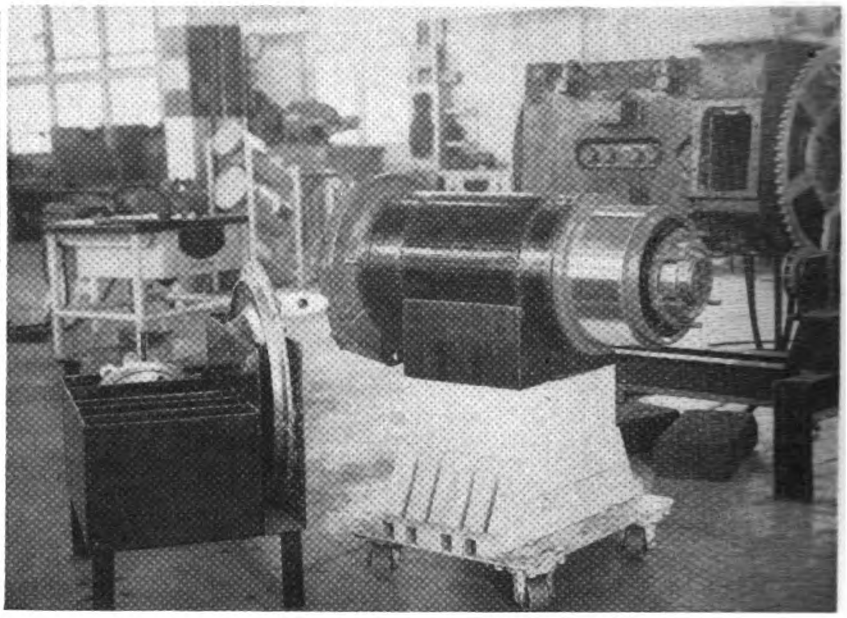
The coils are then reinsulated, and a finished coil with

Lower left: Fig. 5—Terminals applied to cables by welding. Lower right: Fig. 6—Welded cable and terminal sawed apart to show homogeneity of weld









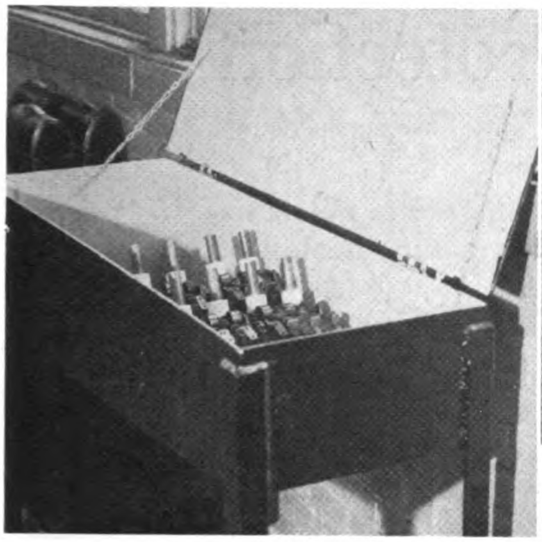
Left: Fig. 7—Portable armature stand and parts stand. Right: Fig. 8—Traction motor frame positioner

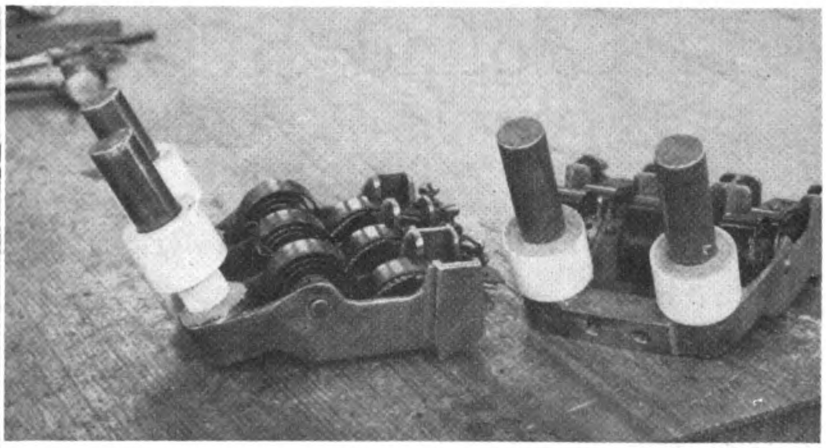
its brazed busbar terminals appears as shown in Fig. 2. After the coils have been taped, they are hung on a special rack and put through the impregnator. Two of these racks are shown in Fig. 3. A set of main field coils and interpole field coils, are shown on a rack at the right before impregnation. In the center, there is a rack holding a set of main field coils after impregnation and a set of interpole coils lies on the floor at the left.

Connections between fields are brazed with brazing tongs. Connections between coils and brush holder rings and between coils and motor leads are welded with Cadweld electrical connections. This process consists of placing the cable and the terminal in a carbon mold which is, in turn, supported in a vise. The mold is hinged and after it is closed about the parts to be welded, it is filled with a compound of powders which will ignite and develop temperatures sufficient to weld the cable and terminal together. The powder is provided in measured quantities in cartridges, and after being poured into the mold, may be ignited with a gas lighter. The reaction requires about 10 seconds and results in a homogeneous joining of the parts as shown in Fig. 6.

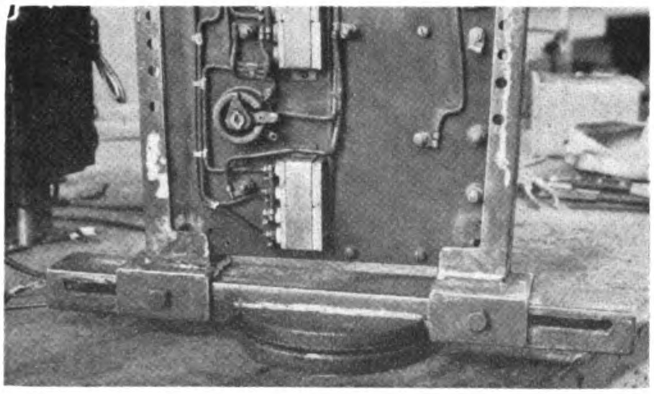
Fig. 9—Each man is equipped with a portable work bench

Fig. 10—The control panel positioning stand in service





Left: Fig. 11—Brush holder cleaning stand. Above: Fig. 12—Commutator stud insulators are applied with white tape and a putty made of talc and insulating varnish. Below: Fig. 13—Control panel positioning stand



In Fig. 7 is shown a portable armature stand. Mounted on rollers, it is used for assembling armatures, bearings and bearing support housings. A second portable stand, shown at the left, has compartments for holding all the parts which are needed.

Work on motor frames is made convenient by the positioner shown in Fig. 8. The frame is secured to a smooth wheel at one end and a toothed wheel on the other. These wheels rest on a pair of rollers at each end of the positioner frame, and the rollers on the forward end have sprockets which engage with those on the wheel. The roller at the right is, in turn, geared to the handle at the lower right, and this handle may be turned to place the frame in any desired position.

Each man has a portable work bench as shown in Fig. 9. It is equipped with a 4-in. vise and a drawer for tools.

The positioner stand, shown in Fig. 13, is mounted on a bench and is used for mounting control panels of all sizes. The two vertical side members of the stand may be moved in or out from the center, and made to support the panel at its edges in a vertical position. The base of the stand is free to rotate on the bench through 360 deg., permitting the placing of the panel in any desired position.

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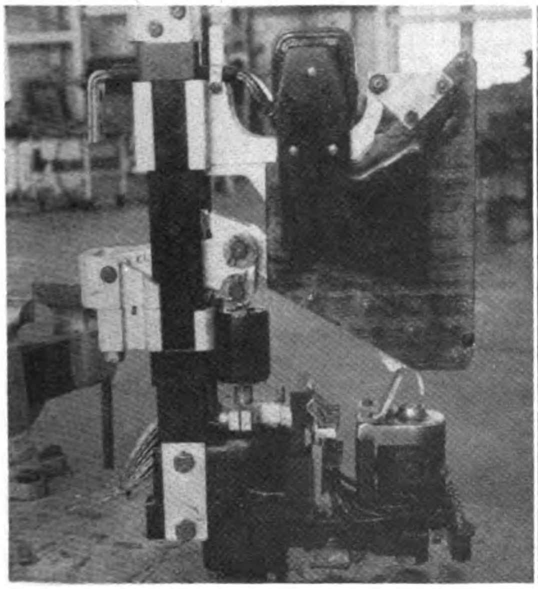


Left: Fig. 14—Fiber parts of power contractors are impregnated and baked. Right: Fig. 15—Motor and generator commutators are stoned in a lathe with a fixed stone

Ground Relay Protection

A discussion of how this device may best be used to detect excessive armature leakage to ground and armature flashovers

By G. R. McDonald
Locomotive and Car Equipment
General Electric Company

A PREVIOUS article* pointed out that the ground relay has a number of different functions to perform. A proper understanding of its operation can only be obtained by considering these functions one at a time. The present article is in the nature of a progress report covering work which has been done in connection with two of the protective features afforded by this important device. These are: armature leakage currents to ground, and armature flashovers.

There is quite a contrast between these two types of protection afforded by a ground relay. Armature leakage, for instance, is very much a matter of degree. Some leakage exists at all times. The question is one of deciding how much may be tolerated without affecting locomotive availability. Small currents may do no harm. Large currents may burn and damage the insulation. Armature flashover, on the other hand, permits no compromise. A flashover must be detected and stopped in the shortest possible time. These contrasting ideas are typical of the various functions which must be performed by the ground relay. They serve to fully illustrate why each function must be considered on its own merits.

The ground relay under discussion is that used with Alco-GE locomotives. It is a negative connected relay with a coil connected between the outgoing negative lead from the generator and ground, as shown in Fig. 1. The relay has a 680-ohm coil and picks up with the application of 38 volts, or a coil current of .056 ampere.

Armature Leakage

A ground in an armature at a particular point is considered in the previous article. An armature may, however, develop generalized leakage to ground. This is caused by an accumulation of dirt, moisture or, more frequently, by a combination of the two, aided and abetted by the presence of oil. This is the type of leakage occurring on a commutator string band, or from armature winding end turns. In Fig. 2 leakage of this type is considered as concentrated over one commutator string band. The leakage path might be thought of as a thin cylinder of high resistance material connected at one end to each of the commutator segments and at the other end to ground. When the armature is in operation, the voltage between brushes of opposite polarity may be considered as being divided between the commutator segments. Current will flow in the high resistance cylinder between points of different potential. This will be in many paths such as between segments and from segments to ground as partially illustrated by Fig. 2.

If the resistance of the armature to ground is measured with a megger, or by other means, a potential will be applied between the commutator side and the ground side of the resistance cylinder. From this the armature resistance to ground may be readily determined. This resistance, by calculation and test, can be related to the leakage currents which operate the ground relay.

Assume that the ground relay connection of Fig. 2 is opened. The resistance from a positive brush to ground will then be the same as that from a negative brush to ground. If voltage is applied to—or being generated by—

*Railway Mechanical & Electrical Engineer, September 1951, pages 69-75.

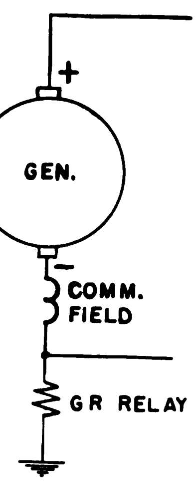


Fig. 1—Typical ground relay connection

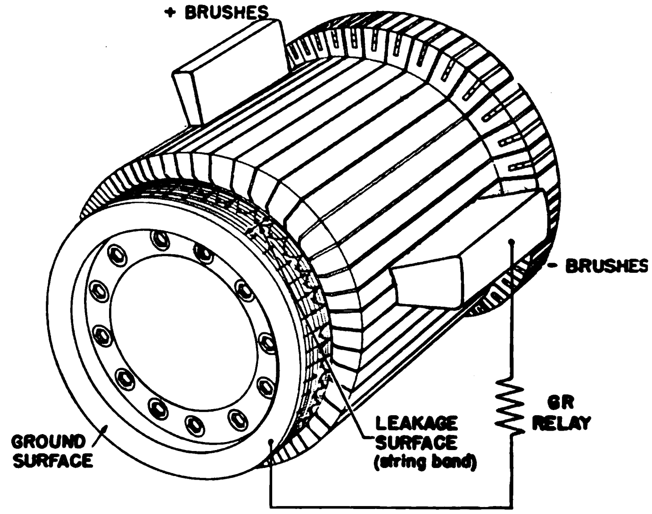


Fig. 2—Distributed leakage over commutator string band

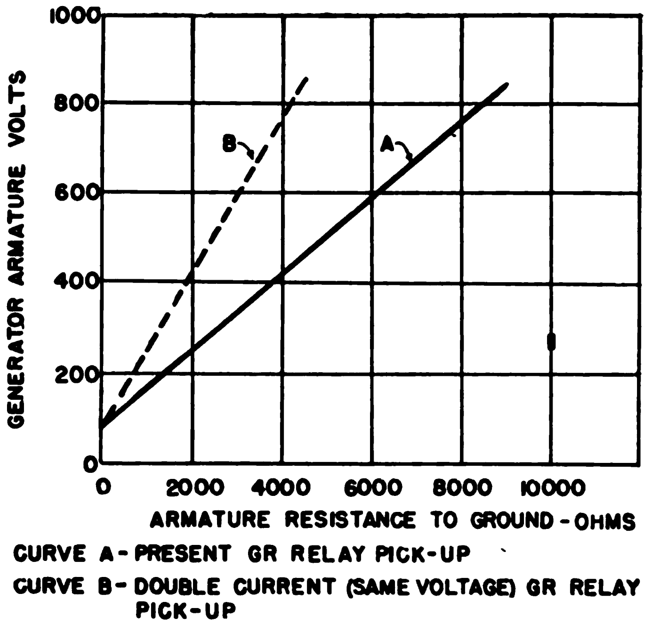


Fig. 3—Ground relay pick-up with distributed armature leakage (generator and parallel-connected motors)

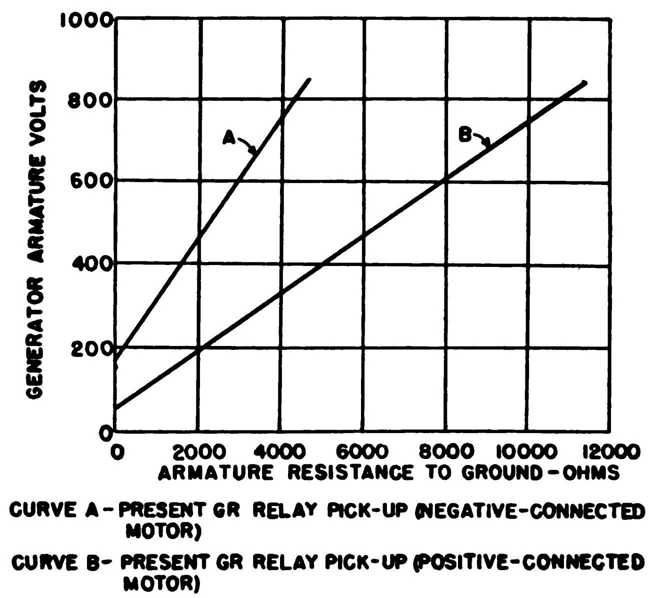


Fig. 4—Ground relay pick-up with distributed armature leakage (generator and series-connected motors)

the armature, the circulating currents in the resistance cylinder will be symmetrical with respect to ground. It is, therefore, apparent that the ground potential will be halfway between the positive and negative brush potentials of the armature.

Now if the ground relay is connected, the potential of the ground ring will be biased toward the negative of the generator. The amount of this bias will depend upon the relative resistances of the ground relay coil and of the leakage cylinder. If the resistance of the cylinder is very low compared to the relay coil, the ground potential will not be biased away from the mid-point by an appreciable amount. Approximately 50 percent of the armature voltage will be applied to the relay coil. With this condition the armature voltage must be built up to double the operating voltage of the ground relay in order to cause operation. This gives one point on curve, Fig. 3.

To obtain other points at higher armature voltages on the curve of Fig. 3, it was necessary to resort to calculations and confirming tests. Tests were made by applying a uniform layer of conducting material on a string band. Armature resistance to ground could then be measured in several well known ways. The operating point of the relay was determined by running the armature and raising its voltage until the ground relay operated. In this way enough data were obtained to complete the curve of Fig. 3.

It is interesting to note that, with all of the leakage confined to and uniformly distributed around the generator armature, an armature resistance as low as 9000 ohms to ground can be tolerated without interfering with locomotive operation.

Another interesting point is that, even with this low resistance, there was no sign of leakage current causing carbonization or permanent damage of the string band. This may be attributed to the fact that the current from any point on the commutator into the leakage surface is continually varying as the armature revolves. Thus concentrated heating at a spot is avoided.

The curve of Fig. 3 may be interpreted in various ways. Consider a locomotive in operation with four motors in parallel connected to the generator. Operation up to full generator voltage would be available without tripping the ground relay as long as the resistance of the five armatures in parallel measures 9000 ohms to ground. If all armatures have the same resistance each one would measure 45,000 ohms to ground.

In the case of a negative-connected motor only 50

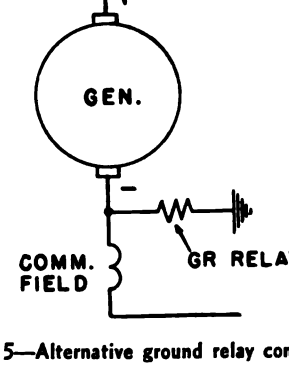


Fig 5—Alternative ground relay connection

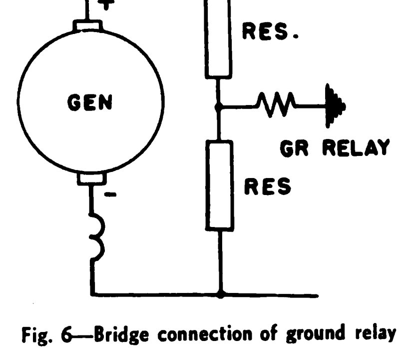


Fig. 6—Bridge connection of ground relay

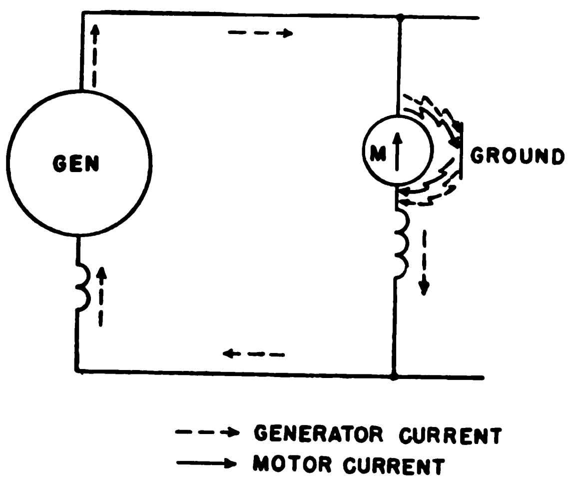


Fig. 7—Current flow during motor flashover

percent of generator voltage would be applied to its armature. The leakage would be the same as for a genrator armature except that the generator voltage would be double that of this motor armature. The voltage scale of Fig. 3 may, therefore, be doubled and the results plotted in Fig. 4.

Consider uniform leakage conditions from the armature of one of the motors connected to the positive side when operating in the series-parallel connection. It is assumed that no other leakage exists. With low armature resistance to ground the voltage applied to the relay would be due to 50 percent of this armature voltage plus the voltage of the negative-connected armature. This amounts to 75 percent of generator voltage. For the same reason the relay is more sensitive for high resistance leakage from this armature as shown by Fig. 4.

If the armature leakage is considered as coming equally from a positive and a negative connected motor, inspection will show that this is the equivalent of leakage from one full voltage armature. Then the conditions of Fig. 3 apply.

Relay Setting

As mentioned above, tests demonstrate that comparatively large leakage currents can be tolerated without damage to an armature. Also, it would be strange if all the leakage current through the relay were coming from only one armature. To insure minimum interference with locomotive operation, it would appear possible to increase the current setting of the relay to some extent. This could be accomplished easily by connecting a resistor in parallel with the ground relay coil. As far as leakage conditions only are concerned, this would be an acceptable way of raising the relay setting. However, for reasons discussed below, it would be much better to change to a lower resistance relay coil and use a resistance in series with the coil to re-establish the 38-volt pickup for the combination.

If the operating current of the ground relay were doubled the operating curve of Fig. 3 would be changed as indicated by the dotted line.

Relay Connections

In the previous article it was pointed out that the ability of the ground relay to recognize a ground on the negative of the system would be improved if the connections were changed from those of Fig. 1 to those of Fig. 5. The relay coil would be connected between ground and a point between the negative generator brushes and the generator commutating field. With this change there would also be less liability of having the relay coil short-circuited and made inoperative by a ground on the negative of the system. This change has been field tested and checked with various protective requirements of the relay with good results.

The bridge connection of the ground relay as illustrated by Fig. 6 is sometimes used. Two resistances of equal value are connected in series across the main generator. The relay coil is connected from the mid point of these two resistors to ground. Consider this connection with regard to the various motor combinations discussed above. It is apparent that this relay will not detect generalized leakage conditions of a generator armature or of parallel-connected motor armatures. When operating in the series-parallel connection, if leakage from one motor armature at a time is considered, this type of relay will give protection. If, however, the leakage is uniform from two of the series-connected armatures, the ground potential would tend to establish at the mid point of the system. Then this type of relay connection would not be operative.

Flashovers

A very important function of the ground relay is to detect armature flashovers of either the main generator or traction motors. When an armature flashes over current may flow, via arcs, in various paths and from various parts of the commutator and brush rigging. Theoretically this could take place without making any connection to ground. The design of the machines under consideration is, however, such that a flashover always involves ground in the circuit. In other words, some or all of the current from one brush holder goes to ground and from ground back to the brush holder of opposite polarity.

Generator Flashover

When a generator flashes over the armature is practically short circuited by the arc. The voltage across the armature is reduced in value and fluctuates as the arcing conditions change. Oscillograms have been taken of the voltage from brushes of opposite polarities to ground. These show approximately equal voltages from ground to each side of the armature. The voltage available to operate a ground relay connected as shown by Fig. 1 or Fig. 5 is, therefore, of a fluctuating value and is approximately half the voltage existing between the generator brushes during a flashover.

Motor Flashover

If parallel-connected motors flash over, the conditions affecting the ground relay are essentially the same as those just discussed for generator flashover. The generator current will increase because of the loss of back EMF from the motor which is flashing over. Generator current will, however, continue to pass through the field of this motor. Consequently this motor, driven by the train, will act as a generator. The current flowing in the flashover arc will be the sum of the currents supplied by the generator and by the voltage generated in the motor armature, as illustrated by Fig. 7. The sudden and large increase of generator current is likely to result in a generator flashover.

The series and commutating pole windings of motors and generators have a large part of the total reactance

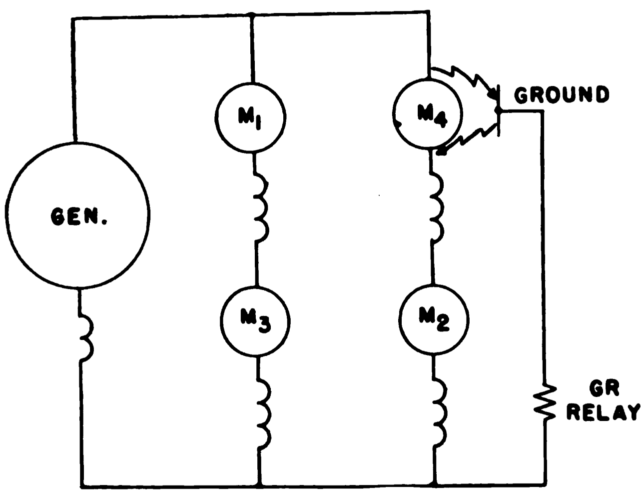


Fig. 8—Positive motor flashover, series-parallel connection

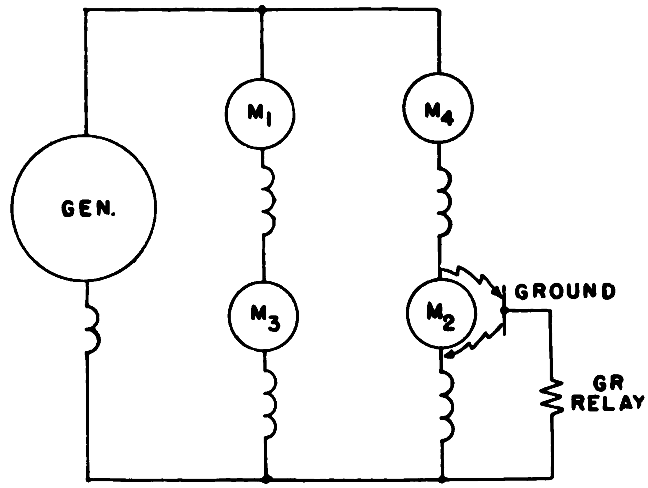


Fig. 9—Negative motor flashover, series-parallel connection

of the circuit. This reactance tends to slow up current changes. In so doing, voltages are produced across these fields which are considerably higher than steady-state values. These voltages may be in either direction, depending on whether the current is increasing or decreasing. They should be considered in connection with ground relay operation during transient conditions. The transient voltages of the motor series field will be considerably reduced if the motors are operating in a shunted field connection.

If a motor flashes over when being operated in the series-parallel connection, the voltage across this motor decreases. The voltage across the other motor in series with it is correspondingly increased. The generator current increases and passes through the field of both of these motors. The motor which is flashing over, therefore, acts as a generator. The current in the flashover arc is the sum of the generator current and that due to the motor acting as a generator. Obviously this introduces two conditions which must be considered in connection with ground relay operation.

If the motor connected to the positive side of the line flashes over, its voltage is decreased. The ground relay may be considered as being connected to the mid-point of this motor voltage. For this reason the voltage applied to the relay consists of two components—the increased voltage across the negative-connected motor and half of the voltage across the positive-connected motor. The generator voltage will be reduced somewhat by the increase in current. There will, however, be ample voltage for operating the ground relay, as indicated by Fig. 8.

If the motor connected to the negative side of the line flashes over, conditions are reversed. The voltage across this motor is considerably reduced. The generator current increases and its voltage is slightly reduced. Fig. 9 makes it obvious that the voltage available for relay operation is not as large as in other flashover conditions. In this case, the inductive voltages of the fields should be considered. For the connections shown in Fig. 1, the relay voltage consists of half the motor commutator voltage plus all of the inductive voltage of the motor field while the generator current is increasing. If the connections of Fig. 5 are considered, the inductive voltage of the generator commutating field should also be added.

During a flashover large currents flow in the circuits involved. A ground relay could be applied to operate on this current or could be arranged to operate on the voltage of part of the circuit. The relay under discussion may, for present purposes, be considered as a voltage relay having a 38-volt pickup. For reasons other than a flashover this voltage should be kept as high as possible. It should not, however, be set so high that the relay would fail to recognize a flashover. The value chosen appears to be a good compromise as indicated by operating experience and tests. Further study and operating data on the many functions of the relay will indicate the direction future improvements should take.

Speed in detecting a flashover is an essential requirement for a ground relay. As already stated, it would be desirable when raising the current setting of the relay, to use a lower voltage coil and a series resistor. This method of changing the relay calibration results in a shorter time constant for the relay coil circuit and tends toward faster operation of the relay.

Relay Connections

As mentioned above, with the particular design of motor and generator equipment being considered, all flashovers involve grounds in the circuit. The relay connections illustrated by Fig. 1 and Fig. 5 have been tried out in connection with a large number of generator flashovers. They have given prompt and positive action in detecting flashovers. The connections of Fig. 5 should, however, give better relay action in the case of a negative-connected motor flashing over during series-parallel operation. The reason for this is that the inductive voltage of the generator commutating field would assist in operating the relay.

Consider the bridge connection of the ground relay, shown in Fig. 6. It has two resistances of equal value connected in series across the main generator with the relay coil connected between the mid-point of these two resistors and ground. If the reasoning already used for generator flashover is applied to this connection, it will be seen that the ground potential should be the same as the mid-point potential between the two resistors. Therefore, except for voltage fluctuations, there is no tendency to operate the relay and detect a generator flashover. Hence this type of connection does not appear to be as positive as that of Fig. 1 or Fig. 5 in detecting a flashover of a main generator or of a parallel-connected motor.

The bridge-connected relay would appear to be quite positive in action when detecting flashovers on a series-connected motor.

Two types of protection provided by ground relays have been discussed here. Other types were discussed in the previous article. The subject is by no means fully covered by these two articles; but if they make it clear that the functions of this relay must be discussed one at a time, they will have accomplished one of their major purposes and opened the door for further progress. In this connection, it should be noted that discussing ground relays in terms of amperes to operate is a completely indefinite procedure unless other features of the relay and its circuits are also fully defined.

A great deal remains to be done in connection with the problems of moisture grounds which improperly interfere with locomotive operation. Plans have been made to actively pursue this further.

Ignitron Locomotives Turn In Good Performance Records

(*Continued from page 65*)

train made up of 162 cars of coal—the train was about a mile and a quarter long—was hauled from the freight yards at Enola, Pa., to Morrisville, Pa., a distance of 130 miles. This run is typical of hard freight service, and contains many curves and crossovers, and frequent grades. The total load on the train was 16,588 adjusted tons. (This was 13,348 actual tons. An adjustment factor of 20 has been established for the Pennsylvania electrified zones.) The run was made at an average speed of 30 miles per hour. Very little sand was applied on this difficult run. On the heaviest grades, it was necessary to use only light sanding in front of the leading truck to prevent slipping.

A good measure of the performance of freight locomotives is gross ton-miles hauled per train running hour. The usefulness of the powerful Ignitron locomotive in handling tonnage is well illustrated by the comparison in the table which gives the performance of the 6,000-hp. Ignitron locomotive (Class E2C) and the present electric locomotives (Class GG1 and P5a) as determined by road tests over the same route. The gross ton-miles per train running hour for the Ignitron locomotive is 400,440 compared with 163,905 and 122,679 for GG1 and P5a locomotives respectively.

During the test run, the minimum speed of the Ignitron locomotive up the 21.2-mile, 0.288-per cent Smithville grade, hauling a train of 162 cars loaded with coal, was 24 miles per hour.

Control Smooth-Riding Good

Extremely smooth, uniform starting is possible with an Ignitron locomotive. This minimizes the possibility of breaking a drawbar during starting. As one railroad man states, "This locomotive starts a 150-car freight train with the same ease that the GG1 (conventional a.c. locomotive) starts a passenger train."

The Ignitron locomotive can "hang on" at low speeds, that is, it can move forward at extremely slow speed without stopping and without overheating the motors. Frequently, this eliminates the necessity of stopping when the train approaches a stop signal: it can creep forward while waiting for the signal to change. This keeps the track behind it clear, so that other trains are not held up.

The Ignitron locomotive is not "slippery." This quality is achieved because the weight is equally distributed on all drivers and the d.c. motors are operated in parallel. The voltage is the same on all motors and they tend to turn at the same speed. Excessive slipping is also minimized by distributing the weight of the locomotive equally on all axles. Equal distribution of weight is essential on any locomotive.

Easy riding, though not apparently a requirement of freight locomotives, is important in extending the life of equipment and reducing maintenance expense. Men who have ridden the Ignitron freight locomotive agree that in ease of riding it excels previous locomotives.

The experience gained thus far with two Ignitron locomotives is convincing evidence that here is a valuable new addition to the motive-power equipment available for electrified railroads. It is a most satisfactory combination of the advantages of an a.c. trolley system with those of d.c. traction motors.

But perhaps the most important feature, considering long-range effects on railroad electrification, is adaptability of the Ignitron locomotive to 60-cycle power. All a.c. railroad systems in this country operate from 25-cycle power, primarily because the single-phase a.c. motor works better at low frequency. However, the Ignitron locomotive operates equally well on either 25- or 60-cycle power and makes possible future railroad electrification at commercial frequencies. Locomotive apparatus for operation at 60 cycles will be smaller and weigh less than 25-cycle equipment, and the size and cost as well as the amount of transmission and distribution apparatus can also be reduced if a frequency of 60 cycles is used. Further economies can be realized by increasing trolley voltages above the presently used 11 kv. Also, 60-cycle distribution apparatus is standardized and produced in large quantities, resulting in still further savings.

Louisville & Nashville Expands Its Electric Shop

(*Continued from page 69*)

Brush holders are cleaned in a bath of Bendix carburetor cleaner with the aid of cleaning stands as shown in Fig. 12. The holders are immersed in the sump at the left. The sump is filled with cleaning solution which is agitated with air during the cleaning operation. After cleaning, the brush holders are placed on a rack at the right end of the stand as shown where they are allowed to drain. It has been found that the cleaner does not damage the brush holder insulation and is highly effective as a cleaner.

To apply porcelain insulators to brush studs, the insulated base of the stud is wound with 1¼-in. white Scotch tape. The base of the stud is covered with a mixture of Loomis Talc and R-583-Y clear baking varnish to form a putty. The insulator is partly filled with the putty and pushed over the tape. The end of the insulator is also filled with the putty, and the studs are then baked four hours at 275 deg. F.

When power contactors are overhauled, the insulating fiber parts are put in the impregnator for 45 minutes and baked for 12 hours. This produces a hard glossy finish as shown in Fig. 14, which resists mechanical abrasion and damage from flashing.

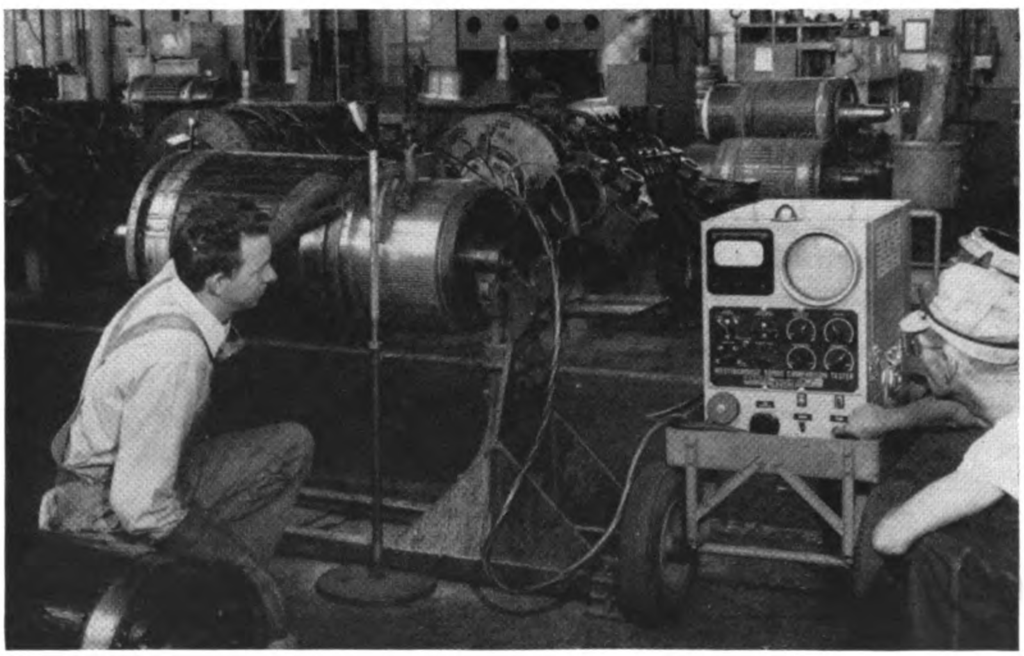
Both traction motor and generator commutators are stoned on a lathe, with a fixed stone as shown in Fig. 15.

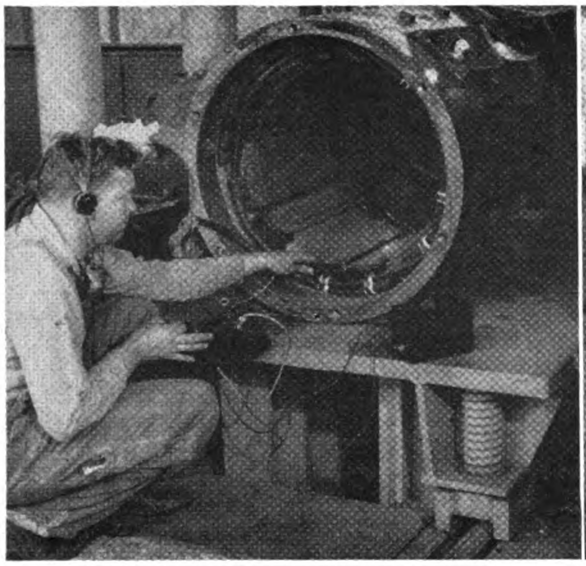
General view of the Atchison, Topeka & Santa Fe traction motor and generator shop at San Bernardino, Cal.

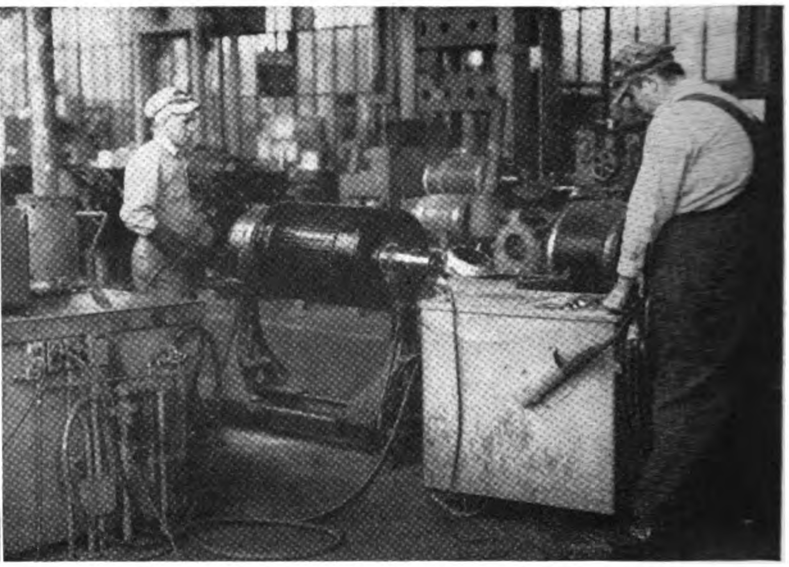
Diagnosing the Condition Of Traction Motors

Routine electrical testing of traction motor armatures and field coil assemblies as practiced by the Santa Fe at San Bernardino, Cal.

The Westinghouse surge comparison tester as used in the shop



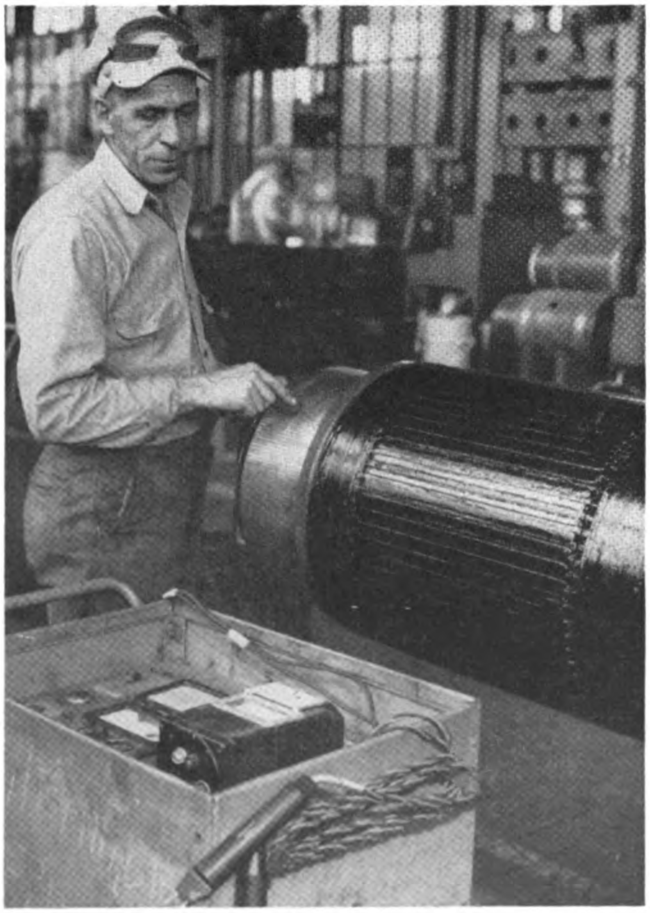




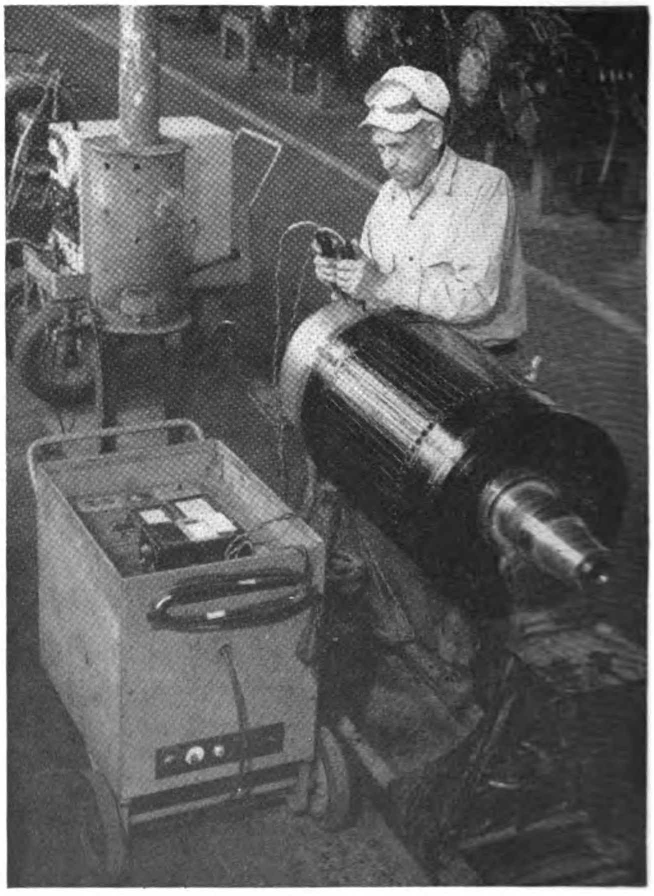
Left: The Electracer provides means for determining the exact location of a ground in a field winding. Right: A high-potential tester being used on a traction motor armature

The Atchison, Topeka & Santa Fe has, over a period of years, developed a routine method for the electrical testing of traction motors which has proved to be highly effective. Instruments used are Megger insulation testers, ductors, high potential testers, surge comparitors and an Electracer.

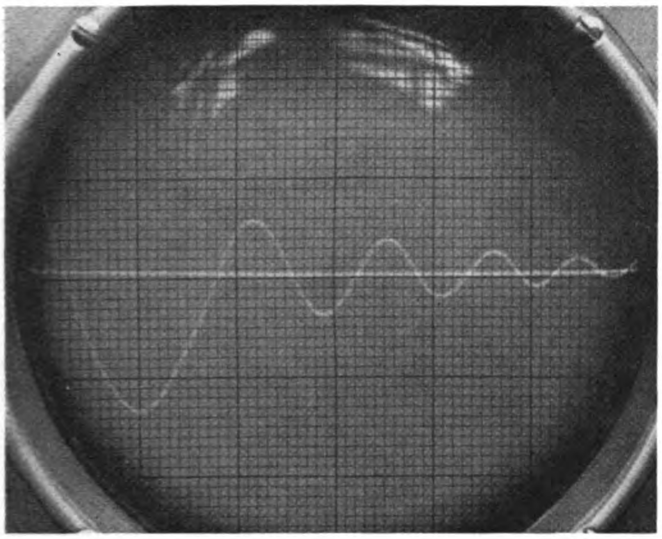
The first test made consists of measuring insulation resistance to ground with a Megger insulation tester. The reading must be in excess of 5 megohms before further tests can be applied. If the resistance is less than this value, cleaning and, if necessary, baking is used to rectify the condition.



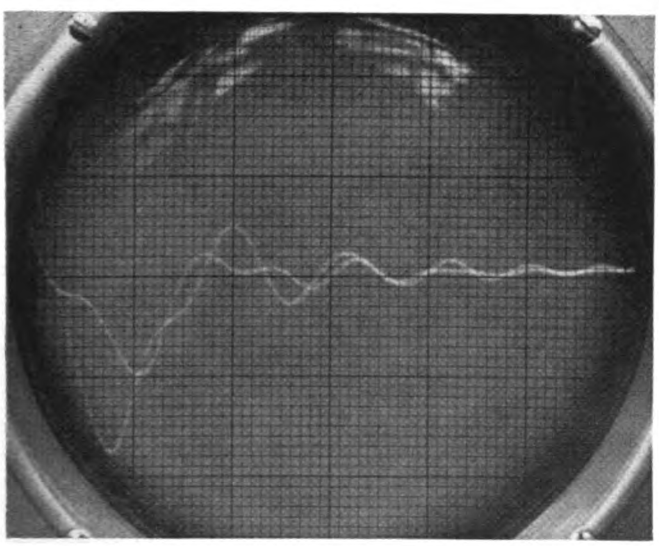
The Megger insulation tester in one of the ductor-megger combinations being used in the first test of a traction motor armature



The Ductor as used in the Santa Fe, San Bernardino shops to find high-resistance riser or brazed back connections in a traction motor armature



A trace on the oscilloscope of the surge comparison tester which shows good insulation between coils



An indication of a short between coils are shown on the oscilloscope of the surge comparison tester

If the insulation resistance, as measured by the megger is satisfactory, a high potential of 2,600 volts is applied for two minutes. This is made with a Westinghouse burn-test high potential tester. If it passes this test, further electrical tests are applied. If not, the armature is repaired or rewound.

The armature is ductor tested to detect high resistance in riser or brazed back connections. Ductors are found best suited for this purpose because they are a low-voltage, high-current device. The ductors used are Biddle combination ductors and Megger insulation testers mounted on wheels to make them easily portable.

For making tests of short circuits between coils, the surge comparitor has been found highly satisfactory. It provides a visual proof by means of an oscilloscope screen of a short circuit between coils or a ground. The ductor and the surge comparitor complement each other, each performing the function to which it is best suited.

Experience in the San Bernardino shop has indicated the advisability of using a spark gap to determine the actual voltage being delivered by the comparitor to the armature under test. The reason for this is that the secondary voltage is dependent upon the impedance of the device being tested and the voltmeter which is in the primary circuit will give erroneous readings on low impedance devices. For this purpose, a standard spark gap is placed in parallel with the device under test with the gap set for the voltage desired as indicated by the "gap" table.

The Megger, the ductor and the high-potential testor are also used for testing field coil assemblies and an Electracer provides a rapid and a precise method of accurately locating grounds in the field coils.

The Santa Fe shop at San Bernardino, Calif., is equipped with five high-potential testing machines, two combination ductor and Megger insulation testers in portable units, two Megger insulation testers, and two Westinghouse surge comparison testers.

CONSULTING DEPARTMENT

Can High Temperature Occur at High Speeds

Some of our diesel locomotive traction motors get too hot when they are pulling high-speed, relatively lightweight trains. I am told that motors overheat only when we keep the current in the red too long. It doesn't seem to make sense to me. Can you explain why this should be so? Or isn't it?

Heating of Diesel-Electric Locomotive Traction Motors

Heat is generated in the operation of any motor, and unless removed, will cause temperatures to continually rise until insulation is damaged, solder is melted, or other damage is done. A ventilating system is provided, therefore, to remove this heat. A motor is normally given a continuous rating at the maximum current for which the ventilating system will continuously remove all of the heat liberated within the motor and keep its temperature within safe limits. This rating is usually based upon current flow (or tractive force due to current flow) because a major portion of the heat loss is due to this current flow.

While a fixed temperature limit is generally set by the character of the insulating materials, it is inevitable that some surfaces within the motor may be hotter or cooler than the average because of the impossibility of distributing the ventilating air evenly to all parts of the motor.

Any current flow higher than the rated current will increase the motor temperature, and current values below the continuous rating will result in temperatures below the safe limit. However, if a motor is operating at a temperature below the safe limit, the copper and

steel parts have the ability to absorb some heat. It is, therefore, permissible to apply an overload for a short time before the temperature is brought up to the rated value. The magnitude and duration of these short time overloads are dependent upon the type of motor and its temperature at the time the overload is applied.

Although the most important portion of the heat liberated within a traction motor is due to the propulsion current that flows through the conductors, there are other important losses that appear in the form of internal heat. Among these are:

(1) Heat generated by magnetic reversals in the steel parts of the motor. (iron loss)

(2) Heat caused by the flow of local circulating currents induced within the copper and steel parts. (stray current loss)

(3) Heat resulting from friction of brushes on the commutator. (friction loss)

(4) Heat generated by the churning of air within the motor. (windage loss)

In a well-designed motor, the approximate proportions of the liberated heat may be:

Armature copper loss due to propulsion current	30 per cent
Field circuit copper loss due to propulsion current	50 per cent
Magnetic reversals (iron loss)	12 per cent
Induced currents (stray current losses)	5 per cent
Friction	1 per cent
Windage	2 per cent
	100 per cent

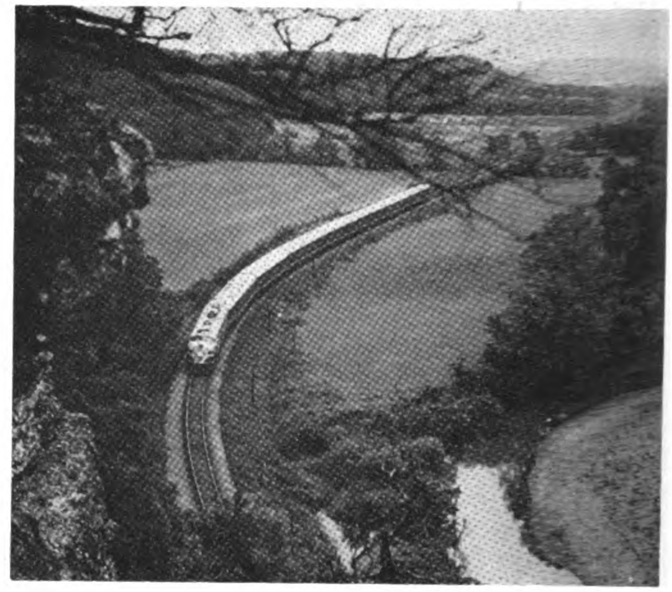
Nearly all of these, except the copper losses, may be considered to vary almost directly with the speed of the motor. The copper losses vary as the square of the current.

It is apparent that the controlling element in motor heating is the propulsion current. For example, assume that a motor has a continuous rating of 1,000 amp. and the diesel engine of the locomotive is large enough to drive the train at 36 m.p.h. at this current. The heat losses at one point above and at two points below this continuous rating are:

Percentage of	(Overloaded) 1,100 amp.	(Continuous) 1,000 amp.	(Underloaded) 900 amp.	800 amp.
Percentage of liberated heat	117	100	89	81
Miles per hour	31	36	43	54

These figures show that overloads can be applied safely only when the motor has been operating below its rated temperature, and that there should be no danger of overheating whenever the current values drop below the continuous rating.

In applying locomotives to a given service, the mistake is often made of considering only the current and tractive force ratings of the equipment and assuming that full ventilation is available at all times. This error is easily made and often causes some cases of overheating that are not readily understood. However, in many of the diesel-electric locomotives in service, the traction motor blowers are driven by the engine in such a manner that blower speed varies with the speed of the engine. Thus, when full power is not needed to maintain train speed, the engine speed is reduced, and at the same time, the traction motor ventilation is decreased. This creates a dangerous situation because the tractive force requirements are not usually reduced in the same proportion that the power demand is reduced. Two examples may



be cited to show the situation resulting when full power is not required, but the tractive force needed to keep the train moving is high.

In the first case, assume that a locomotive is hauling a capacity train on a grade where the full continuous tractive force is needed, and that full power (and hence ventilation) is being applied. If, then, the engineer gets a slow order, he must reduce the power of the engine in proportion to the necessary reduction in train speed, yet the tractive force and current flow to keep the train moving changes very little. With the full continuous current still flowing and nearly the full amount of heat being liberated, the reduction in motor ventilation resulting from lowered engine speed will tend to overheat the traction motors.

The second example is, perhaps, a little more difficult to understand, but arises from the same cause. If a lightweight train is pulled by a locomotive having relatively high power, there are combinations of grade conditions and speed limitations where full tractive force is needed, but again the engine speed must be lowered to limit the top train speed and the ventilation is consequently reduced. In this case, there is another probability—that the paths of this reduced air flow may be distorted by the fan action of the armature, which is still rotating at high speed. A distortion of the air distribution through the motor may create new "hot spots" in the armature, such as at commutator risers. This condition has been noted on a few railroads where solder has melted at the point where the armature conductors are soldered to the commutator risers. Some engineers have attributed this to excessive heat flowing to, and concentrated at, this point from two different sources,—copper and stray current losses within the armature windings, and high friction losses generated by the pressure of the carbon brushes against the commutator. This hardly seems plausible, however, and the former explanation seems much more likely.

The application engineer, in determining locomotive hauling capacities, must give due regard to those operating conditions that may result in the reduction of ventilating air flow or in an increase in temperatures of this air above that of the surrounding atmosphere. To neglect either of these factors is to invite overheating.

A. H. CANDEE
Westinghouse Electric Corporation

Programs Coordinated Mechanical Association Meetings

Chicago, September 15, 16, and 17

Exhibit

Tuesday afternoon, September 16, set aside for inspection of electrical products on exhibit at the Hotel Sherman under the auspices of the Railway Electrical Supply Manufacturers Association, of which W. E. Lynch (General Electric Company) is president and J. C. McPrice (Allen-Bradley Company) is secretary-treasurer.

Coordinating Committee Officers

The officers of the Coordinating Committee, which consists of the presidents and secretaries of the railway associations and the exhibiting organization, are: Chairman, J. P. Morris, general manager, mechanical department, Atchison, Topeka & Santa Fe; F. K. Mitchell, manager equipment, New York Central system, and secretary, C. F. Weil.

Electrical Section of the Engineering and Mechanical Division, A.A.R.

HOTEL SHERMAN
MONDAY, SEPTEMBER 15
10 A. M.

Address by H. F. Finnemore (chairman, Electrical Section), chief electrical engineer, Canadian National.

Business session.

Election of officers.

Discussion committee reports on:

Wire, Cable and Insulating Materials, C. R. Troop (chairman), assistant engineer, New York Central System.

Electrolysis, H. P. Wright (chairman), assistant electrical engineer, Baltimore & Ohio.

Application of Corrosion-Resisting Materials to Railway Electrical Construction, S. R. Negley (chairman), electrical engineer, Reading.

Power Supply, C. P. Trueax (chairman), assistant electrical engineer, Illinois Central.

2 P. M.

Special reports on New Orleans Union Passenger Terminal, by C. J. Wallace, manager, New Orleans Union Passenger Terminal, and J. M. Trissal, assistant chief engineer, Illinois Central.

Discussion committee reports on:

Electric Heating, C. A. Williamson (chairman), electrical engineer, Texas & New Orleans.

Application of Radio and Communicating Systems to Rolling Stock, W. S. Heath (chairman), electrical assistant, Atchison, Topeka & Santa Fe.

TUESDAY, SEPTEMBER 16
9 A. M.

Discussion committee reports on:

Illumination, L. S. Billau (chairman), electrical engineer, Baltimore & Ohio.

Wiring Diagrams for Rolling Stock, E. J. Feasey (chairman), general supervisor of diesel equipment, Canadian National.

Car Electrical Equipment, S. B. Pennell (chairman), assistant engineer, New York Central System.

Welding and Cutting, L. E. Grant (chairman), engineer of tests, Chicago, Milwaukee, St. Paul & Pacific.

12 NOON

Joint luncheon with Railway Electric Supply Manufacturers' Association and Allied Railway Supply Association. Speaker, J. P. Kiley, president, Chicago, Milwaukee, St. Paul & Pacific.

WEDNESDAY, SEPTEMBER 17
9 A. M.

Discussion committee reports on:

Car Air Conditioning Equipment, A. E. Voight (chairman), car-lighting and air-conditioning engineer, A.T.&S.F.

Electrical Facilities and Practices for Repair Shops.

1:45 P. M.

Committee on Automotive and Electric Rolling Stock, C. A. Wilson (chairman), general supervisor diesel engines, Atchison, Topeka & Santa Fe. (Joint session with L.O.M.A.)

Exhibitors—1952
Railway Electric Supply Manufacturers Association

Allen-Bradley Company Chicago
Anderson Mfg. Co., Albert & J. M., Chicago
Berger Co., George R., Chicago
Biddle Co., James G., Philadelphia
Bogue Electric Mfg. Co., Paterson, N. J.
Bogue Railway Equipment Div.,
Brady Company, W. H., Milwaukee
Buchanan Electric Products Corp., Chicago
Buckeye Telephone & Supply Co., Columbus
Bussmann Mfg. Co., Chicago
Dayton Rubber Company, Dayton
Dow Corning Corp., Midland, Mich.
Edison, Inc., Thomas A., Chicago
Electric Storage Battery Co., Chicago
Equipment Research Corporation, Chicago
Farr Company, Chicago
Federal Electric Products Co., Chicago
General Electric Company, Chicago
Gould-National Batteries, Inc., Chicago
Ideal Industries, Inc., Sycamore, Ill.
K. W. Battery Company, Inc., Skokie, Ill.
Luminator, Inc., Chicago
Minneapolis-Honeywell Regulator Co., Minneapolis
Modern Railroads Publishing Co., Chicago
National Carbon Div., Union Carbide & Carbon Corp., New York
National Electric Coil Company, Columbus
National Electric Products Corp., Chicago
Nife Incorporated, Copiague, Long Isalnd, N. Y.
Okonite Company, Chicago
Pyle-National Company, Chicago
Railway Mechanical & Electric Engineer, Chicago
Safety Car Heating & Lighting Co., Inc., Chicago
Spicer Manufacturing Div. of Dana Corp., Toledo
Sticht Co., Inc., Herman H., New York
Thomas & Betts Company, The, Chicago
Trumbull Electric Department of General Electric Company, Chicago
Vapor Heating Corp., Chicago
Waukesha Motor Company, Waukesha, Wis.
Western Lithograph Company, Los Angeles
Westinghouse Electric Corp., East Pittsburgh, Pa. and Chicago

Air Brake Association

MORRISON HOTEL

MONDAY, SEPTEMBER 15
10 A. M.

Address by President K. E. Carey.

Proper Procedure of Repairing and Handling Air Brake Equipment—Central Air Brake Club.

To create, by Association, a Closer Interest of Air Brake Men, by G. W. Misner, Westinghouse Air Brake Company.

Methods of Measuring System Leakage—St. Louis Air Brake Club.

2 P. M.

Freight and Passenger Train Handling and Dynamic Braking (Joint session with R. F. & T. E. A.), T. H. Bickerstaff (chairman), supervisor air brakes, Atchison, Topeka & Santa Fe.

TUESDAY, SEPTEMBER 16
9 A. M.

Address by J. W. Hawthorne, general superintendent motive power and equipment, Atlantic Coast Line.

Air Leakage on the Individual Car, by Martin Alger, Jr., New York Air Brake Company.

Standardization of Air-Brake Equipment for Diesel and Turbo-Electric Locomotives, C. E. Miller (chairman), supervisor air brakes and steam heat equipment, New York Central System.

Report Approved Maintenance Practice Committee, F. W. Dell (chairman), Grand Trunk Western.

The Release Control Retainer as a Means for Better Braking—Manhattan Air Brake Club.

WEDNESDAY, SEPTEMBER 17
9 A. M.

The Brake Cylinder Release Valve, by L. A. Stanton, general air-brake instructor, Great Northern.

Maintenance and Repairs of Diesel Locomotive Air Compressors—Pittsburgh Air Brake Club.

Symposium an Automatic Freight-Car Slack Adjusters.

2 P. M.

Completion of papers and discussion of committee reports.

Election of officers.

Unfinished business.

Car Department Officers' Association

HOTEL SHERMAN

MONDAY, SEPTEMBER 15
10 A. M.

Address by President W. N. Messimer, general superintendent equipment, Merchants Despatch Transportation Corporation.

Address by A. E. Wright, vice-president and general manager, Manufacturers Railway, and president and general manager, St. Louis Refrigerator Car Company.

Report of Committee on Interchange and Billing for Car Repairs, J. J. Sheehan (chairman), supervisor car repair bills, Missouri Pacific.

2 P. M.

Report of Committee on Air-Conditioning Equipment—Operations and Maintenance, R. F. Dougherty (chairman), general electrical and air conditioning inspector, Union Pacific.

Report of Committee on A. A. R. Loading Rules, A. C. Bender (chairman), joint supervisor car inspection, Cleveland Car Inspection Association.

TUESDAY, SEPTEMBER 16
9 A. M.

Report of Committee on Inspection, Conditioning and Repairing Cars for Higher Commodity Classification, T. E. Hart, chief car inspector, New York, Chicago & St. Louis.

Comments by C. A. Naffziger, director, National Freight Loss and Damage Prevention Section, Association of American Railroads.

Report of Committee on Car Lubrication, K. H. Carpenter, superintendent car department, Delaware, Lackawanna & Western.

Comments by W. M. Keller, director mechanical research, Association of American Railroads.

WEDNESDAY, SEPTEMBER 17
9 A. M.

Report of Committee on Analysis of Train Yard Operation, W. B. Medill, master car repairer, Southern Pacific.

Report of Committee on Wheel-Shop Practices, E. W. Kline, general wheel shop foreman, Baltimore & Ohio.

Report of Committee on Painting—Some Aspects of Railway Equipment Maintenance, F. M. Vogel, painter foreman, Denver & Rio Grande Western.

Miscellaneous reports.

Election of officers.

Locomotive Maintenance Officers' Association

HOTEL SHERMAN

MONDAY, SEPTEMBER 15
10:30 A. M.

Apprentice Training—Committee on Diesel Personnel Training, E. V. Myers (chairman), superintendent motive power, St. Louis-Southwestern.

Thirty-five Years of Progress in the Enforcement and Observance of Laws Intended to Improve the Safety and Efficiency of Railway Operation, by W. J. Patterson, member, Interstate Commerce Commission.

2 P. M.

Oil Leaks, Crankshaft and Bearing Failures—Committee on Diesel Mechanical, J. W. Luke (chairman), general supervisor diesel engines, Atchison, Topeka & Santa Fe.

Possibilities of Diesel Parts Reclamation—Committee on Diesel Material Reconditioning and Control, F. Thomas (chairman), assistant to general superintendent equipment—diesel and electric, New York Central System.

TUESDAY, SEPTEMBER 16
9 A. M.

Standardization, Control and Distribution of Tools for Diesel Work—Committee on Shop Tools, F. E. Molloy (chairman), superintendent motive power, Southern Pacific.

12 P. M.

Luncheon honoring all railroad presidents. Speaker—J. P. Kiley, president, Chicago, Milwaukee, St. Paul & Pacific.

WEDNESDAY, SEPTEMBER 17
9 A. M.

Diesel Locomotive Cleaning; Improving Productivity of Steam Locomotives—Committee on Shop Practices, C. H. Spence (chairman), superintendent shops, Baltimore & Ohio.

Determination of Diesel Facilities—Committee on Diesel Terminal Facilities, H. E. Niksch (chairman), superintendent motive power and equipment, Elgin, Joliet & Eastern.

Team Work—A Safety Essential, by E. H. Davidson, director, Bureau of Locomotive Inspection, I. C. C.

2:15 P. M.

Wheel Slip Detection—Committee on Other Diesel Maintenance, F. Thomas (chairman), assistant to general superintendent equipment—diesel and electric, New York Central System.

Flashovers, Cause and Prevention—Committee on Diesel Electric, W. P. Miller (chairman), assistant to chief mechanical officer, Chicago & North Western.

Master Boiler Makers' Association

HOTEL SHERMAN

MONDAY, SEPTEMBER 15
10 A. M.

Address by President Harrcy C. Haviland.
Report of Executive Board.
Financial report.
Message by Secretary-Treasurer Albert F. Stiglmeier.
Association business.

2 P. M.

Address by William C. Wardwell, superintendent equipment, New York Central System.

Report on Topic No. 2—Study and recommendations for water tanks on diesel locomotives to better facilitate inspection and washing. S. E. Christopherson (chairman), retired supervisor of boiler inspection and maintenance, New York, New Haven & Hartford.

Report on Topic No. 1—Study of the advantages and disadvantages of steam heat plants, A. E. DeForest (chairman), assistant to superintendent of equipment, Michigan Central.

Association business.

TUESDAY, SEPTEMBER 16
9:30 A. M.

Report of Committee on Law.

Address by E. H. Davidson, director, Bureau of Locomotive Inspection, I. C. C.

Report on Topic No. 3—Study and recommendations on method of staying side sheets and crown sheets with view to eliminate threading holds, F. E. Milligan (chairman), general boiler inspector, Canadian Pacific.

Election of officers.

WEDNESDAY, SEPTEMBER 17
9:30 A. M.

Report of Executive Board.

Address by C. T. DeWitt, superintendent of safety, Northern Pacific.

Report on Topic No. 4—Study and recommendations for the welding and brazing of diesel locomotive and tender parts, Joseph Michne (chairman), welding instructor, New York Central.

History, Progress and Development in the Manufacture and Repair of Locomotive Boilers and Tenders, by C. B. Peck, editor, *Railway Mechanical and Electrical Engineer.*

Water treatment as presented and discussed by the Master Boiler Makers' Association during the past 50 years, by Carl A. Harper, general boiler inspector, Cleveland, Cincinnati, Chicago & St. Louis.

2 P. M.

Report of Committee on Memorials.

Report on Topic No. 5—What can the boiler supervisors do to better educate themselves for positions other than boiler supervisor, F. E. Godwin (chairman), system chief boiler inspector, Canadian National.

Selection of topics for 1953 meeting.
Report of Committee on Resolutions.
Association business.

Railway Fuel and Traveling Engineers' Association

HOTEL SHERMAN

MONDAY, SEPTEMBER 15
10 A. M.

Address by President R. H. Francis.

Secretary's report.

Water Treatment—Steam and Diesel Locomotives, G. E. Anderson (chairman), general fuel supervisor, Great Northern.

Improvement and Efficiency in the Use of Coal for Steam Locomotives, C. R. Patterson (chairman), fuel supervisor, Canadian National.

Excitation System Alco-G.E. Diesel Locomotives (with slides), R. D. Nicholson (chairman), general road foreman engines, New York, New Haven & Hartford.

2 P. M.

Passenger-Train Handling; Freight-Train Handling; Dynamic Braking, T. H. Bickerstaff (chairman), supervisor air brakes, Atchison, Topeka & Santa Fe. (Joint session with Air Brake Association.)

TUESDAY, SEPTEMBER 16
9 A. M.

Definition of Specifications for Diesel Fuel Oil, T. L. Henley (chairman), chief fuel supervisor, Missouri-Kansas-Texas.

Use of Diesel Fuel Oil and Loss of Fuel, T. L. Henley (chairman), chief fuel supervisor, Missouri-Kansas-Texas. Steam Generators—Trouble Shooting, etc., W. H. Fortney (chairman), chief road foreman engines, Cleveland, Cincinnati, Chicago & St. Louis.

Safety on Railroads and Proper Observance of Signals, by H. P. Hamilton, St. Louis-San Francisco.

Diesel Operation, Including Improper Handling of Locomotives, R. R. Rich (chairman), road foreman of equipment, Chicago, Rock Island & Pacific.

Train Delays Caused by Diesel Failures—Cause and Remedies, T. J. Conway (chairman), fuel supervisor, Texas & Pacific. (operating), Texas & Pacific.

Employe and Public Relations, by L. C. Porter, vice-president (operating), Texas & Pacific.

WEDNESDAY, SEPTEMBER 17
9 A. M.

Safety Precautions on Diesel Locomotives, R. D. Nicholson (chairman), general road foreman engines, New York, New Haven & Hartford.

Importance of Making Proper Reports, etc., by Edward H. Davidson, director, Bureau of Locomotive Inspection, I.C.C.

Tracing Schematic Wiring Diagrams of EM Model F-7, E-8, GP-7 Diesel-Electric Locomotives (with slides), F. G. LaMaster (chairman), system fuel supervisor, Chicago, Burlington & Quincy.

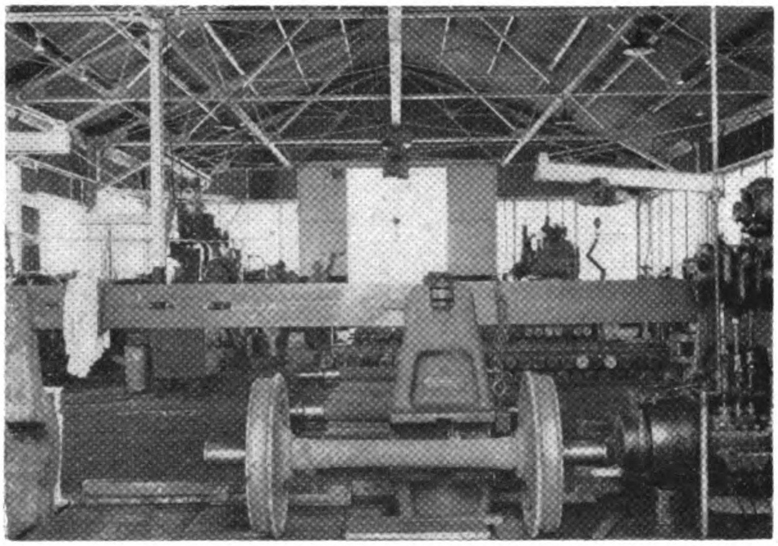
Prevention of Loss and Damage and Personal Injuries Due to Rough Handling, G. B. Curtis (chairman), road foreman of engines, Richmond, Fredericksburg & Potomac.

2 P. M.

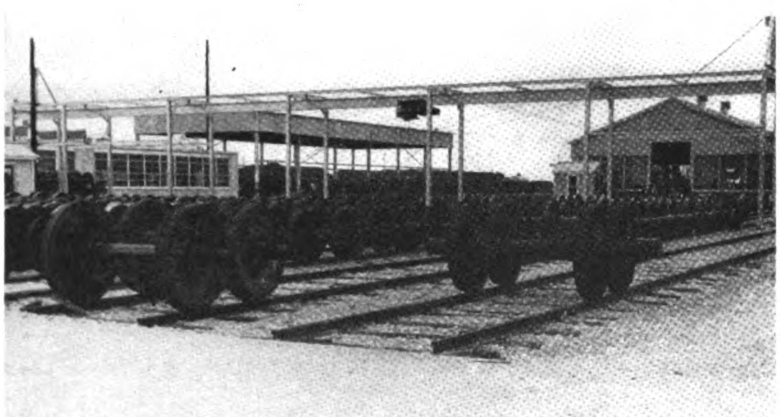
Results of Election.

Air Pollution and Smoke Abatement, M. G. Stewart (chairman), road foreman of engines, Washington Terminal Co.

Education of Road Supervision and Engine Crews, R. H. Francis (chairman), general road foreman equipment, St. Louis-San Francisco.

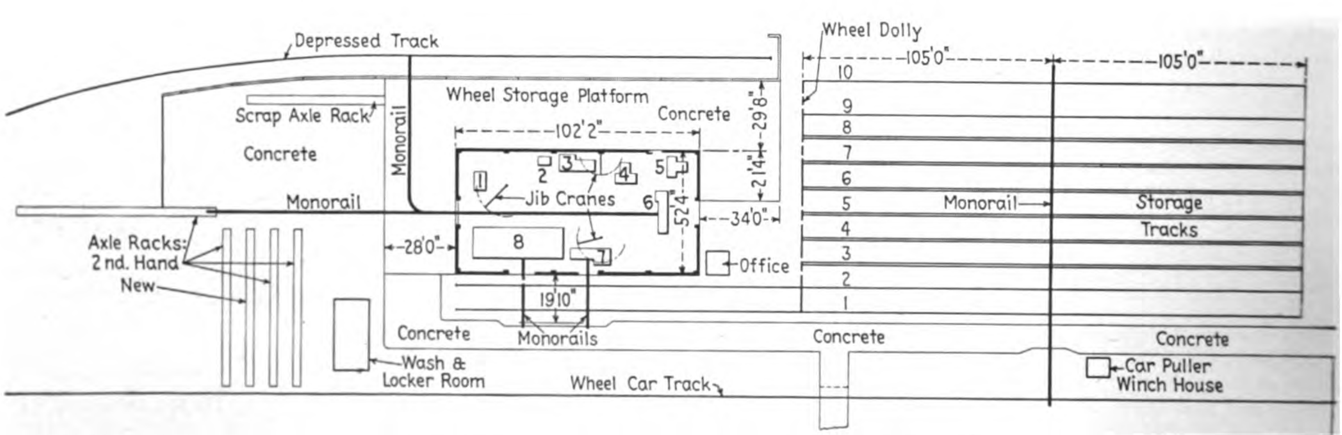


Looking through the shop from the north end. The overhead monorail extends through the building and out the south end.



Looking towards the shop from the northwest corner of the 10-track wheel storage area.

Missouri Pacific Wheel Shop at Houston



1—Bullard Cutmaster
2—Grinder
3—Axle lathe
4—Wheel boring mill
5—Wheel boring mill
6—Wheel press
7—Gap lathe
8—Wheel lathe

General layout of the shop and storage facilities

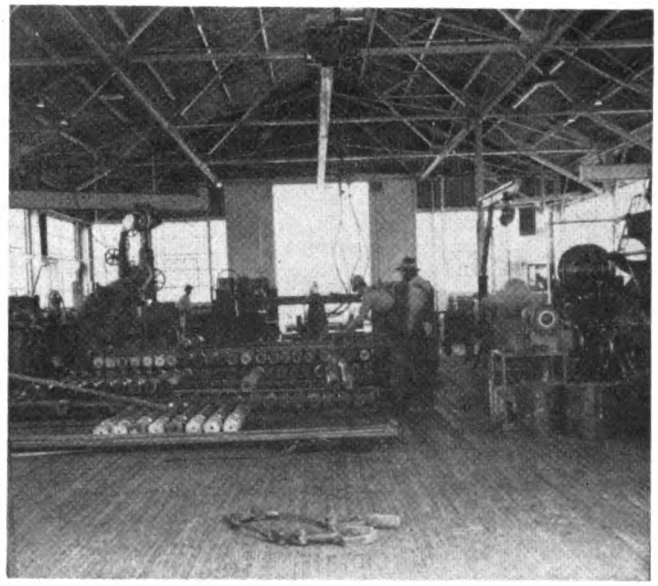
THE Missouri Pacific's new wheel shop at Settegast, Houston, Tex., has ample space for the storage and movement of materials and features an extensive monorail crane system for efficient material handling.

The shop and the storage facilities are laid out with the principal dimension running north and south, the north end of the shop building being the entrance end. Beginning at the extreme north end of the overall facilities. and working south, there are ten tracks leading toward the shop building for the storage and movement of mounted wheels. Seven of the tracks are 210 ft. long and terminate about 40 ft. north of the shop building. Two of the tracks extend past the north end of the building and run to the south end along the east side. The tenth track extends through to the center of the shop building. This building is 102 ft. long and 52 ft. wide. East of the building and the storage tracks is a 12-ft. concrete driveway running parallel to the tracks and the shop building, extending beyond the south end.

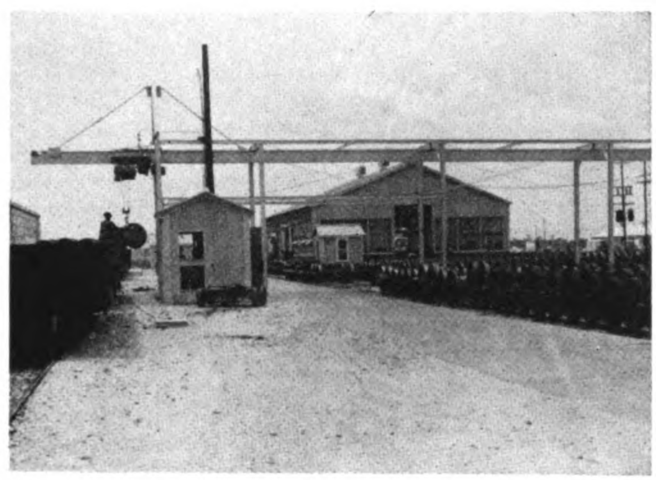
An extensive area around three sides of the shop is concreted to form a single large wheel storage platform. This extends outward from the north end 34 ft., and runs from the shop entrance to a line 29 ft. beyond the west side. The concreted area then runs southward at this depth beyond the west side to a line 28 ft. beyond the south end. The latter strip runs down along the south end as far as the east side. Another section of concrete joins this irregular shaped platform along the westernmost 50 ft., extending about 90 ft. to the south. The area below this latter extension is covered with gravel and contains axle racks and miscellaneous storage space.

Beyond the west edge of the concreted area is a depressed track for loading and unloading wheels from box cars and flat cars. This track begins at the northernmost end of the wheel storage platform and extends southward to connect with the yard trackage. Mounted wheels are delivered to or shipped from the shop on a wheel car track along the east limits of the repair facilities.

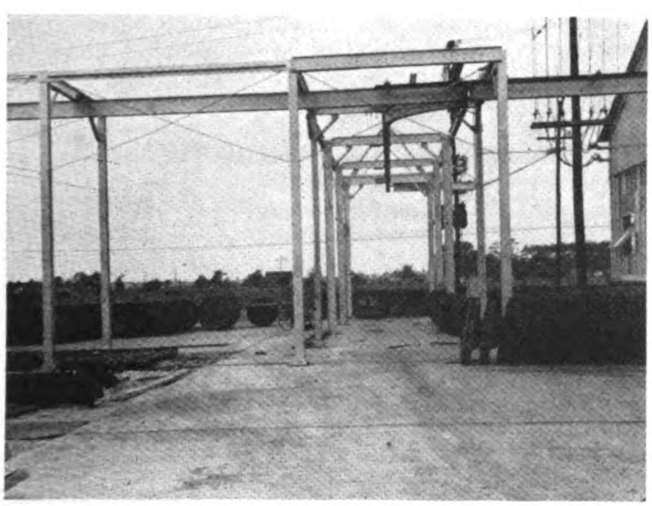
Four separate monorail systems are included in the layout. One extends from the track for receiving and delivering mounted wheels from wheel cars and crosses over all ten storage tracks. A second runs down the center of the shop building, beginning at a point over the wheel press just inside the north end; it extends on through the south end of the shop. Just outside the building, one branch turns west to the depressed wheel track 18 ft.



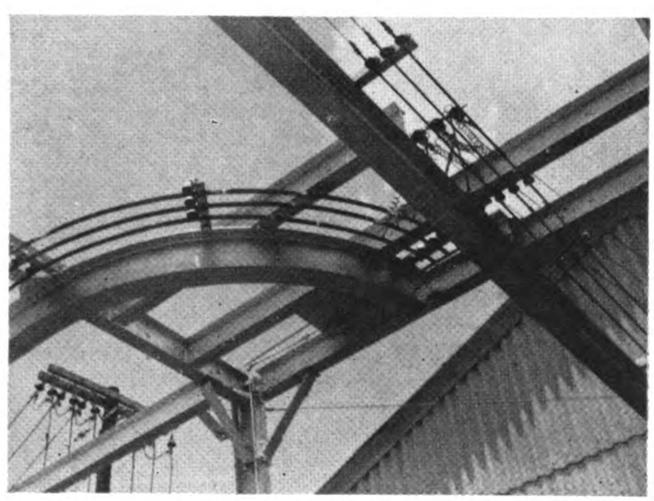
The shop as seen from the south end. A second-hand axle is being deposited on the rack in front of the axle lathe.



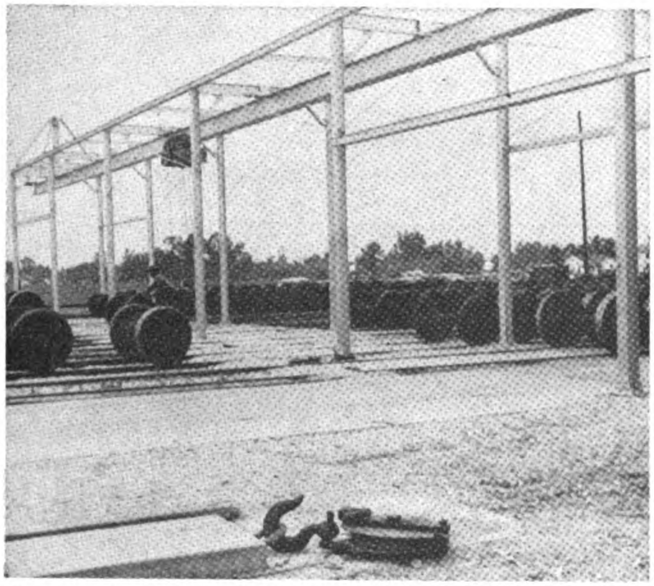
Mounted wheels are unloaded from the wheel car and transferred to the appropriate storage track by the monorail crane.



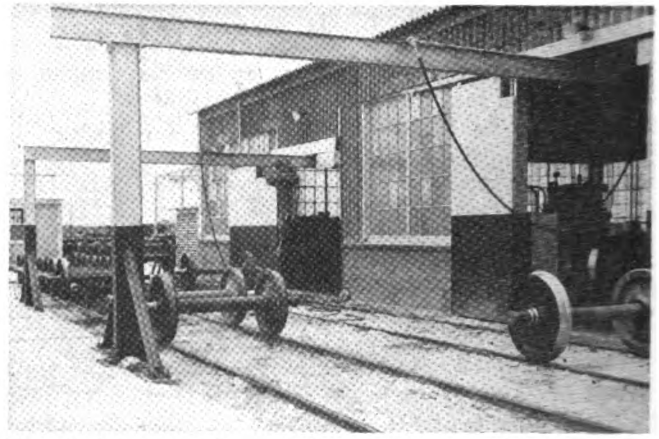
The monorail at the south end of the shop extends west to the depressed track as well as further south to the axle rack.



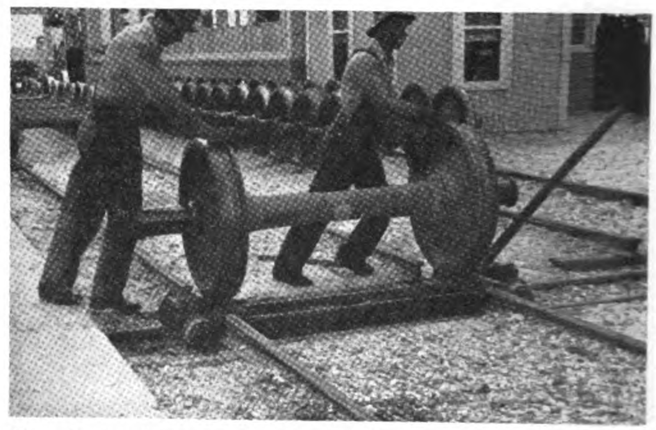
Switch for transferring the hoist either to the depressed track or to the axle rack.



The concrete drive-way in the foreground serves the rip track and can be used to by-pass full storage tracks.



The wheel lathe and the gap lathe are each served by an individual monorail which extends across Tracks 1 and 2



The wheel dolly comes close enough to the concrete drive-way to permit transfer of the wheels from the dolly to a lift truck.

beyond the south end. The other branch continues south to a large rack for second-hand axles. The remaining two monorails are short, extending across the two tracks along the east side of the building and running into the building to serve the wheel lathe and the gap lathe.

All hoists are electrically powered for both raising and movement, and all have a capacity of two tons with the exception of the hoist serving the wheel track and the storage tracks, which has a four-ton hoist. The monorail which runs down the center of the building and out to the depressed track has two hoists, while the remaining three have one hoist each.

Wheel Storage Tracks

The ten storage tracks north of the shop building are numbered one through ten from east to west. Tracks 1, 2, 9 and 10 are single tracks, while the six tracks in the center are double tracks.

Tracks 1 and 2 are for inbound steel wheels requiring turning. Track 3 is for 100,000-lb. OK wheels, either chilled cast or one-wear steel. Track 4 is for 80,000-lb. OK wheels of any type .Track 5 is for all types of bad order wheels except steel wheels which require turning or journal work.

Track 6 to 10, inclusive are primarily for OK wheels. Tracks 6 and 7 are for multiple-wear coach wheels while tracks 9 and 10 are for diesel wheels. Track 8 is a general storage and overflow track. It may contain either serviceable or defective wheels.

There are two methods of transferring wheels between the different storage tracks or from any one of the tracks to Track 5 for movement into the shops. The monorail crane serving the wheel car track and the ten storage tracks can pick up wheels from the wheel car and place them on any one of the storage tracks for further movement by hand rolling along the track. The second means of moving wheels between different storage tracks, but not to or from the wheel car track, is a small hand-operated four-wheel dolly running from Track 1 to Track 10 at the extreme south edge of the stub tracks. These two arrangements, plus the concrete drive-way between track 1 and the wheel car track, permits storage of wheels on any of the ten tracks on either side of the monorail without interfering seriously with easy movement.

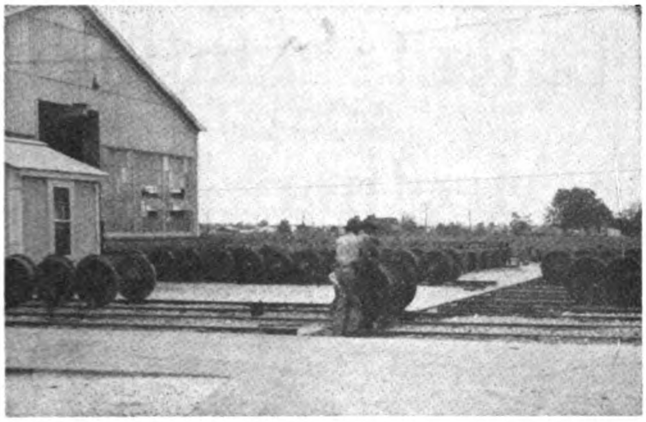
A good example of the alternate methods of movement available with this set-up can be shown by assuming that mounted wheels to be moved to the demounting press in the shops is north of the monorail on Track 8 (the general storage and overflow track). If there are wheels stored on track 8 south of the crane but Track 5 is clear from the crane to the dolly, the wheels can be rolled to the crane, moved by the crane to Track 5 and rolled in.

If Track 8 is clear south to the dolly, but track 5 has wheels on it, the wheels can be rolled to the dolly and carried to track 5 by the dolly for rolling into the shop. If tracks 5 and 8 are full south of the crane but another track is empty, the wheels can be rolled to the crane, moved by the crane to the empty track, rolled south on the empty track to the dolly and moved by the dolly to track 5 for rolling into the shop.

Finally, if all tracks are full south of the crane, the wheels can be moved by the crane to the concrete driveway by the monorail and then by shop tractor to the wheel press. In addition to its use as a by-pass for a full storage track, the concrete driveway is also used for truck movement of wheels to and from the rip track and for general shop service.

Movement Within the Shop

Wheels en route to the gap lathe for journal work or to the wheel lathe for tread turning normally move toward the machine on Track 2. Movement from the track



In addition to the monorail, a dolly can be used to transfer mounted wheels between tracks at the south end of the wheel storage area.

to the appropriate machine is by one of the short two-ton monorails, each of which serves one of the machines. Movement from the machine monorail crane back to storage is normally made on Track 1. Either track, however, can be and is used for movement in either direction when clear.

All bad-order wheels are placed on Track 5 initially for the foreman to determine disposition except where the defect is obvious enough for the unloader to determine. In such cases, the unloader places the wheels on the track and at the location to which it would ultimately be directed by the inspector. After sorting, all bad-order wheels, except steel wheels to be turned, are placed on Track 5 for movement into the shop. Those to be demounted are rolled into the shop by hand and on to the press without using the overhead monorail which runs lengthwise down the center of the shop building.

When wheels are demounted at the press the wheels generally are rolled away by hand while the axles are carried by the shop monorail. OK second-hand wheels are rolled by hand to the storage area immediately outside the door on the northeast section of the wheel storage platform. Scrap wheels are rolled directly from the demounting press to the car on the depressed track.

Second-hand axles are moved on the monorail to the area in front of the axle lathe which is along the west wall of the building in the approximate center. Any excess second-hand axles which cannot be accommodated in this area are carried by the monorail to one of the second-hand axle racks south or southeast of the shop building. Scrap axles also are handled by the monorail to the scrap axle rack located about 75 ft. southwest of the shop.

New cast-iron wheels are stored on the platform along the west wall of the shop from the north end toward the center of the platform. New steel wheels are stored toward the south end. The purpose of this arrangement is to have the cast wheels closer to the shop entrance as there are more of them. New diesel wheels and new passenger car wheels are stored in the same general area as the steel freight car wheels.

New wheels are rolled by hand either to the boring mill or to the storage area when they are delivered in a box car on the depressed track. When delivered in a flat car the wheels are moved directly to the boring mill on the monorail crane. Bored wheels to be mounted are rolled in by hand.

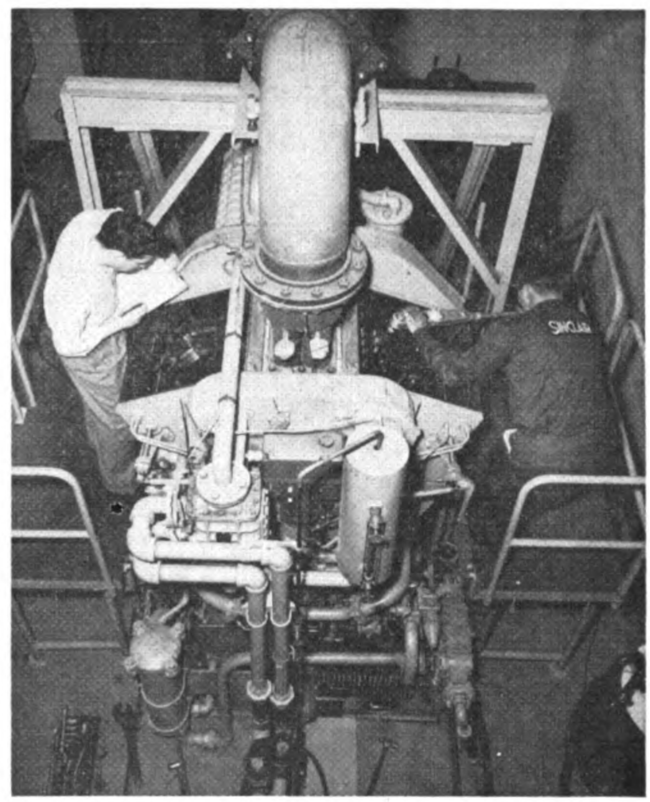
New axles are unloaded by the monorail and moved either to storage or to the mounting press. When mounted, the wheels are rolled to the dolly for distribution to the proper track.

Equipment in the Shop

The shop has eight principal machines. The wheel press is located at the north door. The wheel lathe and the gap lathe are located near the east wall and each is served by a monorail crane from the outside. The gap lathe is further served by a 12-ft. jib crane with a 1-ton hoist. Axles are inspected on a Magnaflux machine.

Two boring mills are located in the northwest corner. The one nearest the corner has a manual chuck and is used for steel wheels. The one further south has an automatic chuck and is used for cast iron wheels. The axle lathe is located to the south of the second boring mill and is served by the same type jib crane as the gap lathe, 1 ton with 18 ft. boom. This crane also serves the storage area for second-hand axles in front of the axle lathe. Just beyond the axle lathe is a 3 in. by 12 in. tool grinder.

The remaining machine is a Bullard Cutmaster recently purchased for boring and facing hubs of wheels already turned. It is served by a 12-ft. jib crane with a 2-ton hoist.



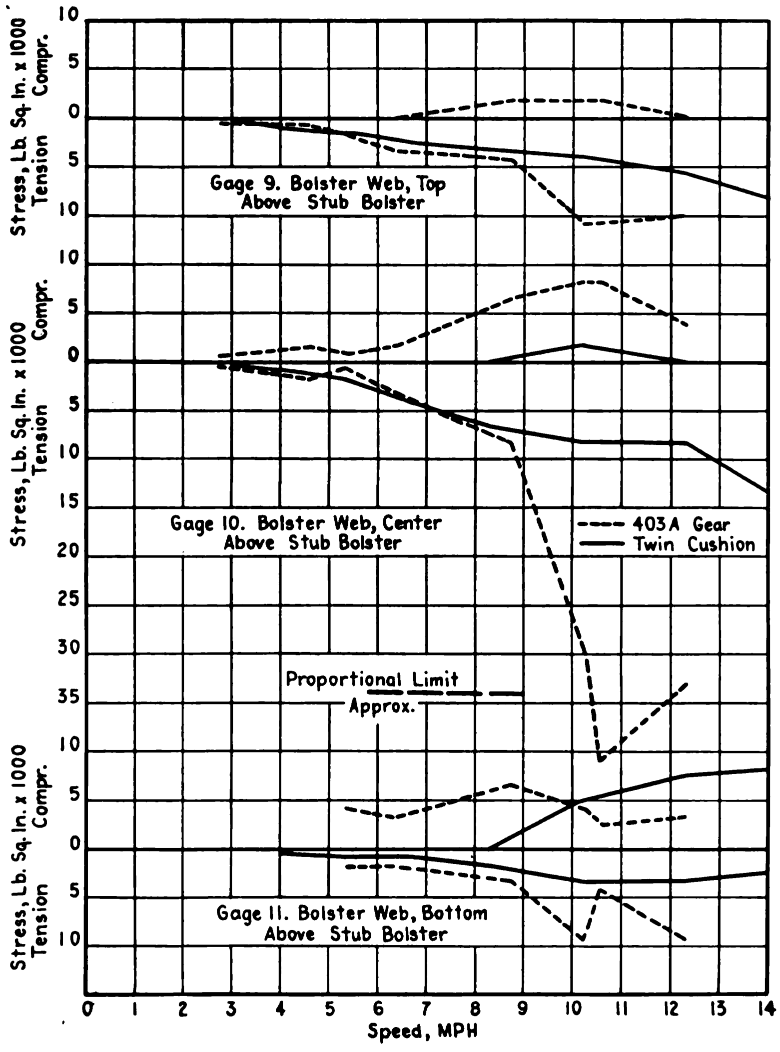
EMD 2-567B railway diesel engine recently installed in the Sinclair Research Laboratories at Harvey, Ill., for the testing and development of lubricating oils for heavy-duty service. With the exception of a shorter crankshaft and camshaft, more counterweights to eliminate vibrations, one blower instead of two, and one oil-filter cartridge instead of the usual four found on a locomotive, the engine uses standard locomotive parts in all locations. The fuel consumption is approximately 11½ gal. an hour at a rated speed and load of 800 r.p.m., 188 brake horsepower. Lubricating-oil capacity of the crankcase is 40 gal. and the water-jacket capacity 22 gal. Operating test periods range from 300 to 500 hrs. at 800 r.p.m. brake horsepower with elevated oil and water temperatures equal to the severest conditions encountered in railway service. The engine is being inspected at 100-hr. intervals, at which time samples of crankcase oil are removed and sent to the laboratory for analysis and spectrographic examination. The results thus obtained will be used as an indication of oil stability and engine condition. At the end of the test period the engine is to be disassembled and all parts inspected, rated and measured for wear. Jacket-water rust inhibitors are also being tested while the oil tests are in progress.

Draft Gear Developments Outlined At A.S.M.E. Meeting

Cincinnati symposium shows progress to date and added protection necessary in modern high-speed operation

With modern well-maintained draft gears and other cushioning devices adequate to afford protection at impact speeds only up to about four or at most 7 m.p.h., what happens to freight-car structures and lading when these switching speeds are exceeded in the ever increasing urge to get cars through yards with less delay? As a matter of fact, impact speeds up to 10 m.p.h. or more are by no means uncommon and all present indications point to increased rather than reduced speeds of switching in the future.

Railroads are therefore faced with the option of continuing to pay out large sums for lading and car damage, or spending a reasonable proportion of this money for shock-control equipment of higher capacity. In other words, the problem is now more economic than mechanical, since manufacturers are in a position to supply draft gears and cushioning devices with as much capacity as railroads are willing to pay for and provide the space to install. This thought was emphasized repeatedly at an important symposium on the subject sponsored by the Railroad Division at the recent semi-annual meeting of the A.S.M.E. at Cincinnati, Ohio.



Stresses in the body bolster web with Twin Cushion and friction draft gears at comparable impact speeds.

Rubber Draft Gears

One of the speakers, A. M. Bixby, vice-president, Waugh Equipment Company, traced the development of rubber draft gear from 1929, first in passenger service and then, in June 1940, in freight service, when five car sets of Twin-Cushion freight type draft gears were applied to General American stock cars.

The Twin Cushions in one of these stock cars have been periodically check tested by the A.A.R. under the 27,000-lb. hammer at the draft-gear laboratory at Purdue University. After nearly one year of service a 5.75-in. free fall of the 27,000-lb. tup produced a capacity of 18,760 ft. lb. After four years of service and approximately 25,000 miles, the same tup fall produced 19,912 ft. lb. capacity. After eight years of service and more than 500,000 car miles, the same tup fall produced 19,238 ft. lb. capacity. The gears are still in service and are scheduled for another check test this year, after 12 years of service.

In a check to determine the effect of extended periods of inactivity on the resilient properties of rubber, the A.A.R. found the capacity of the gear under a 5.25-in. tup fall was 18,100 ft. lb., as compared with a capacity of 18,200 ft. lb. for the new rubber, after a period of seven years stored in the A.A.R. laboratory, but subjected to a monthly laboratory calibration under the drop hammer throughout the period.

Another A.A.R. test to determine the effect

of inactivity in combination with normal weather conditions showed that after two years of inactivity under exposure conditions simulating that of a car stored on a siding a 5.5-in. free tup fall developed a capacity of 18,700 ft. lb., precisely the same as that developed at the beginning of the test.

Mr. Bixby also referred to the development of synthetic rubber for Twin Cushions during World War 2 which has shown no change of capacity after more than five years of service. He also described the results of low-temperature tests for brittleness of a new natural rubber compound in which it passed the minus 40 deg. and minus 70 deg. F. brittleness requirements and developed a lowest non-failure temperature of 75.4 deg. F.

A series of impact tests was conducted by a car builder with a 70-ton hopper car loaded to a rail weight of 204,460 lb. in 1948 to determine the stresses in various structural members. Gages were located at 50 stress points throughout the car which was tested with a Twin Cushion and a friction draft gear. One of the graphs summarizes the stresses in the body bolster. The gage at the center of the bolster web shows stresses increasing fairly proportionately with the Twin-Cushion gear to 14 m.p.h. The 10.2 m.p.h. impact caused the over-solid friction gear to stress the bolster nearly to the proportional limit, while the 10.6 m.p.h. impact caused the bolster to yield.

In closing, Mr. Bixby said that "rubber may be successfully used as a draft-gear medium, and that it will perform uniformly over at least a decade of service. Twin-Cushions will protect freight-car structure and lading under extreme operating conditions, and contribute to improved riding of passenger equipment."

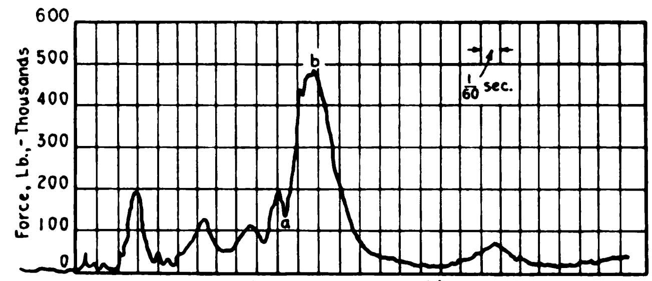
Cushioned Underframes

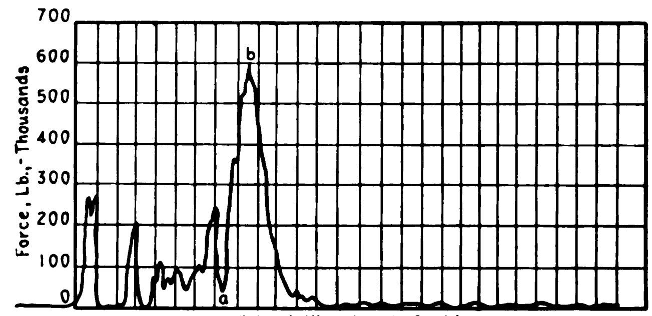
W. K. Durbon, vice-president, Hulson Company, reviewed briefly the history of the cushioned-underframe cars initially brought out in 1927 by the Duryea Corporation, which was merged with the Hulson Company early in 1950. A program was then undertaken to investigate the cushioning capacity required of cushioned underframe cars, coupler and body forces due to switching impacts, and static and dynamic laboratory testing of troublesome details, primarily of welded connections.

Tests were made at the impact testing plant of the Symington-Gould Corporation in June 1951 on two fully loaded box cars with a rail weight of 169,000 lb. of the single-spring underframe design. The struck car was equipped with an electric coupler dynamometer. The velocity of impact ranged from two to 10.25 miles per hour and was measured by the track chronograph. Two-way ride recorders were installed on the side sills near the bolster at the struck ends of the cars.

Three series of tests were conducted. In the first, one test car was impacted into a second. Both cars were equipped with Waughmat cushions and free to roll away after impact. In the second series the struck car was backed up with three cars. In the third, the Waughmat cushions were removed and all but ¾ in. slack taken up, making it equivalent to a standard single-spring Duryea car, and the first test repeated.

For under-solid blows the forces obtained at the coupler were in reasonable agreement with those obtained statically for the Duryea system. For impact speeds up to 5 m.p.h. the largest peak forces were 100,000 lb. which rose to about 775,000 lb. at 10.25 m.p.h. for cars equipped with the Waughmat cushions. Without the Waughmats the same force was reached at about 9 m.p.h. The initial coupler force due to the inertia of the sill plus





Oscillograph record of the forces developed in impact tests on cars with Duryea sliding center sills, with and without Waughmat cushion draft gears.

that required to overcome friction is substantially reduced by the Waughmat application. The greatest draft forces or tension on the coupler due to recoil were in the order of 100,000 lb. maximum, and, therefore, of little consequence.

In both cases shocks as shown by impact registers did not reach Zone 3, considered by many railroad men to be the beginning of the rough handling zone, until a coupling speed of about 7 m.p.h. was reached.

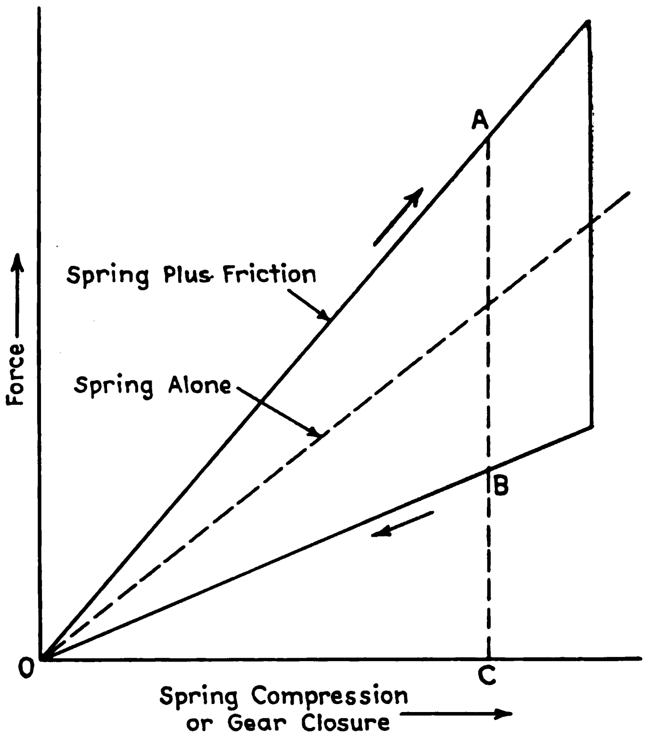
In the typical oscillograph record there is evident a difference in the degree of slope of the final force curve from *a* to *b*. This is the rate of change of acceleration. High forces at the coupler were developed in both cases, but there is not the sudden increase in the diagram showing the result with the Waughmat draft gears. The impact register in this case record was 0.85 in. Without the Waughmats, the record was 1.15 in.

The Depew tests of June 1951 clearly indicated that the capacities of the test cars were inadequate to handle cars and lading safety at coupling speeds of more than 7 m.p.h. During the past year studies of the Hulson Company indicate that capacities of 200,000 ft. lb. or more required to provide a margin of safety above the 7 m.p.h. limit are not only reasonable, but mechanically feasible.

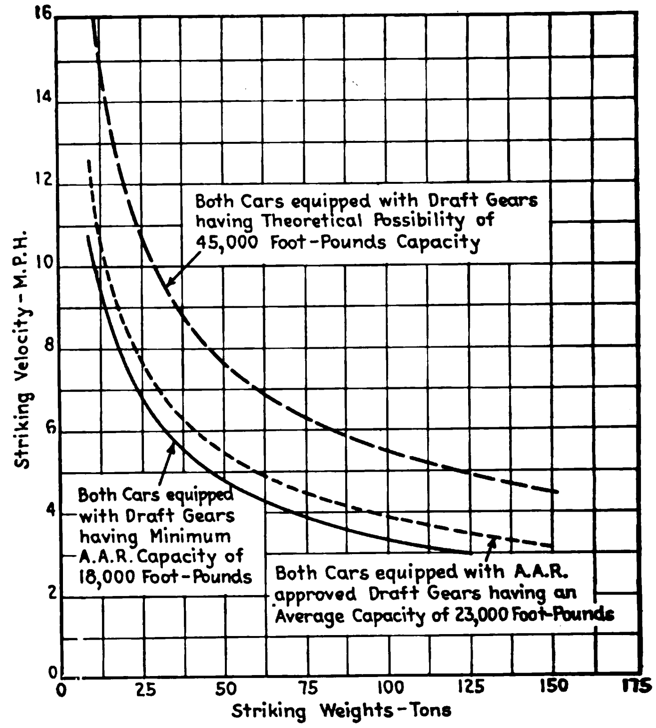
"Soundly engineering improvement in longitudinal cushioning of proper capacity provides a new means that can be used by the railroads to compete with other forms of transportation," said Mr. Durbon in closing. "Present classification yard schedules can be maintained, while damage to lading by impact can be controlled. The problem is not now mechanical, but rather one of economics."

Metallic Friction Draft Gears

The case for metallic friction draft gears was presented by N. T. Olsen, vice-president, Peerless Equipment Company, Chicago. The following is a condensation of his paper.



Simplified force-closure diagram assuming no initial compression and friction proportional to spring force



Effect of added draft-gear capacity in increasing the safe impact velocity.

The present A.A.R. requirements for draft-gear dimensions were determined by existing standards of car construction that at the time of their adoption had been in effect for about 26 years. These standards had also more or less influence on the limit set for draft gear travel, although in choosing these limits consideration was given to capacity that could be secured without exceeding a safe maximum pressure.

A change in draft gear pocket design, that is, more space in which to build the gear is not impossible; however, such previous requests have never met with favorable reception. A change of fundamental dimensions should not be made too hastily, but should be carefully analyzed so that it can be decided if such changes will encourage real improvement in design over the enormous number of approved friction gears now in service.

Several friction draft gears have been produced having travel up to 4 in., and the selective-travel gear incorporates a long travel in buff and a short travel in pull. The buff service is more severe than pull service and the longer buff travel permits greater buff capacity. Road tests with this draft gear, however, did not indicate any outstanding advantage occurring from its greater buff capacity when it came to reducing shocks incident to stopping trains under severe brake applications. The extra buff travel apparently created greater slack action in the train.

The present-day minimum A.A.R. requirements for capacity of a draft gear is 18,000 ft. lb. Presently we have nine fully approved draft gears that have met requirements of the A.A.R. specifications, and that have an average capacity of approximately 23,000 ft. lb. Utilizing the present maximum gear travel of 2¾ in. and a reaction starting at zero and building up in a straight diagonal line to 400,000 lb., which is considered a safe value for modern car construction, it is theoretically possible to secure about 45,000 ft. lb. capacity in a draft gear. If a draft gear that met the above conditions and also retained other desirable characteristics, such as freedom from sticking, low recoil, satisfactory endurance, sturdiness and life, and could be economically produced, a considerable increase in car protection would be afforded.

From the curves of striking weights vs. impact velocities, it can be seen that for a striking weight of 50 tons, the safe colliding speed for 18,000 ft. lb. capacity gears is 4.82 m.p.h.; for 23,000 ft. lb. capacity gears is 5.42 m.p.h.; and for the 45,000-ft.-lb.-capacity theoretical gear is 7.61 m.p.h. The latter speed is an increase of 40.3 per cent over the average of the presently approved nine draft gears.

Just recently the U.S. Navy requested quotations on friction draft gears, specifying that manufacturers guarantee that no damage to car structure or contained parts will result in impact speeds at 10 m.p.h. for a special type car weighing about 86 tons. Checking the curves for a car of such weight, indicates that the present average approved draft gears will safely take impacts at about 4.25 m.p.h., or approximately 42.25 per cent of that requested by the Navy.

Draft gears could easily be designed that would afford protection at higher impact speeds in classification yards, but then their protective value in train operation would be less because of their stiffer action. It is generally claimed, that the majority of the damage to car and lading occurs in the classification yard due to impact speeds beyond the capacity of the friction draft gear, but it is entirely possible there may be even more damage in train operation if the draft gears were too stiff for such service. At least, impact speeds in a classification yard can be controlled somewhat, but to control the action in train operation is very difficult.

It should be remembered that a draft gear's ability to absorb energy depends on the forces developed and the distance through which these forces are permitted to act. Conversely, for a given energy absorption the average forces vary inversely as the amount of relative motion between the acting bodies during impact. It would seem

then that as long as draft-gear manufacturers are limited to the present travel of 2¾ in., and the necessity for keeping forces developed during impact at a minimum, future improvements in metallic friction draft gears will lie in better distribution of the force of impact throughout the draft-gear cycle.

During World War II great advances were made in a simple and accurate technique of measuring rapidly varying forces by use of the resistance type electric strain gage. One of the draft gear manufacturers, becoming familiar with this technique in working on practical ordnance problems, suggested its use for measuring draft gear forces under a drop hammer. The manufacturer, in the interest of improving the art of draft gear testing, sponsored a development test at the A. A. R. laboratory at Purdue University in order to determine suitable equipment for direct measurement of gear forces.

The equipment used to obtain force-time records in this program consisted of SR-4 wire strain gages mounted on four steel cylinders as the force pick-up unit, a potentiometer-type strain circuit, a cathode ray oscillograph and a rotating drum camera.

Three of the sponsoring manufacturer's draft gears having different characteristics were tested in this program, using the above-mentioned equipment. The results obtained were quite promising, and a complete report of the findings was furnished to the A. A. R. Draft Gear Sub-Committee, and later to the other draft-gear manufacturers. At the suggestion of the sub-committee, all of the friction draft-gear manufacturers submitted their gears to be tested by this method, and the results have been published in the A. A. R. Draft-Gear Testing Laboratory Report dated January 15, 1951.

It is quite possible that a very simple and highly accurate method of determining forces set up in a draft gear during closure will be developed, and then the designer will be better able to determine the force-closure characteristics of a gear which in all probability will result in draft gears of higher capacity while still retaining low terminal forces and other desirable characteristics.

Still another factor that has greatly handicapped the draft gear designer is the lack of sufficient knowledge concerning the work required of a draft gear in modern train operation and its relation to laboratory characteristics of a draft gear. It is entirely possible that a gear may show high reaction and erratic action in the laboratory, but will lose these undesirable characteristics when placed under a car. The presence of rust on the friction surfaces, so common in actual service and absent in a laboratory, no doubt, tends to reduce the coefficient of friction between the sliding surfaces which in itself will tend to smooth out gear action. Then again, due to the resiliency of the car structure, forces set up during draft gear closure may be considerably less in actual service than in the laboratory.

Before any correlation between laboratory and service performance of a draft gear could be made, an extensive series of tests, both laboratory and service, would have to be made using all of the modern testing equipment. available. Such program would be rather expensive and would require careful analysis to draw any satisfactory conclusions. However, if the desired information could be obtained from such a test, its aid to draft gear designers would be invaluable in their efforts to further develop draft gears that are so vitally needed on railroads today.

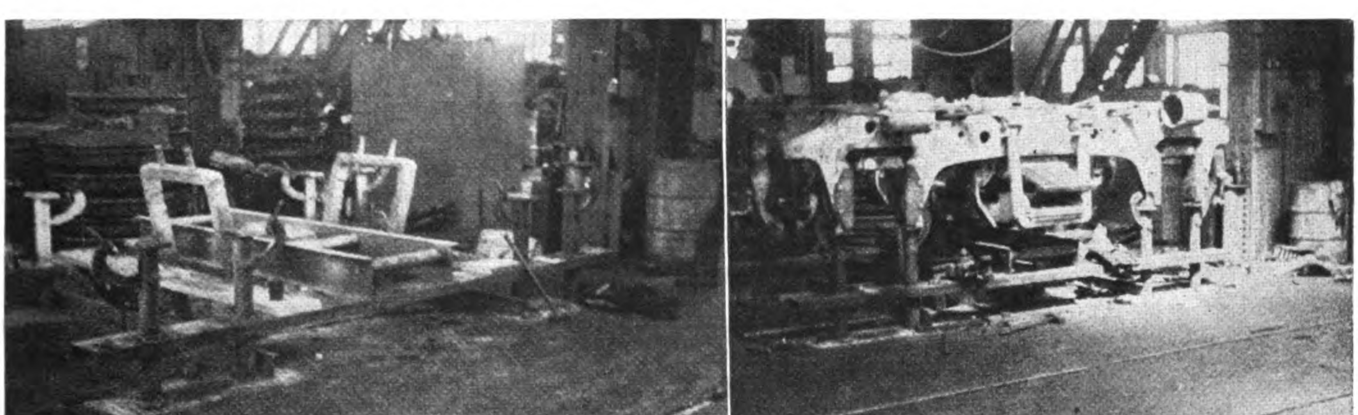
Repairing Alco Three-Piece Trucks

A cradle device used in repairing the side frames of Alco three-piece trucks has been developed at the San Bernardino shops of the Santa Fe, as shown in the illustrations.

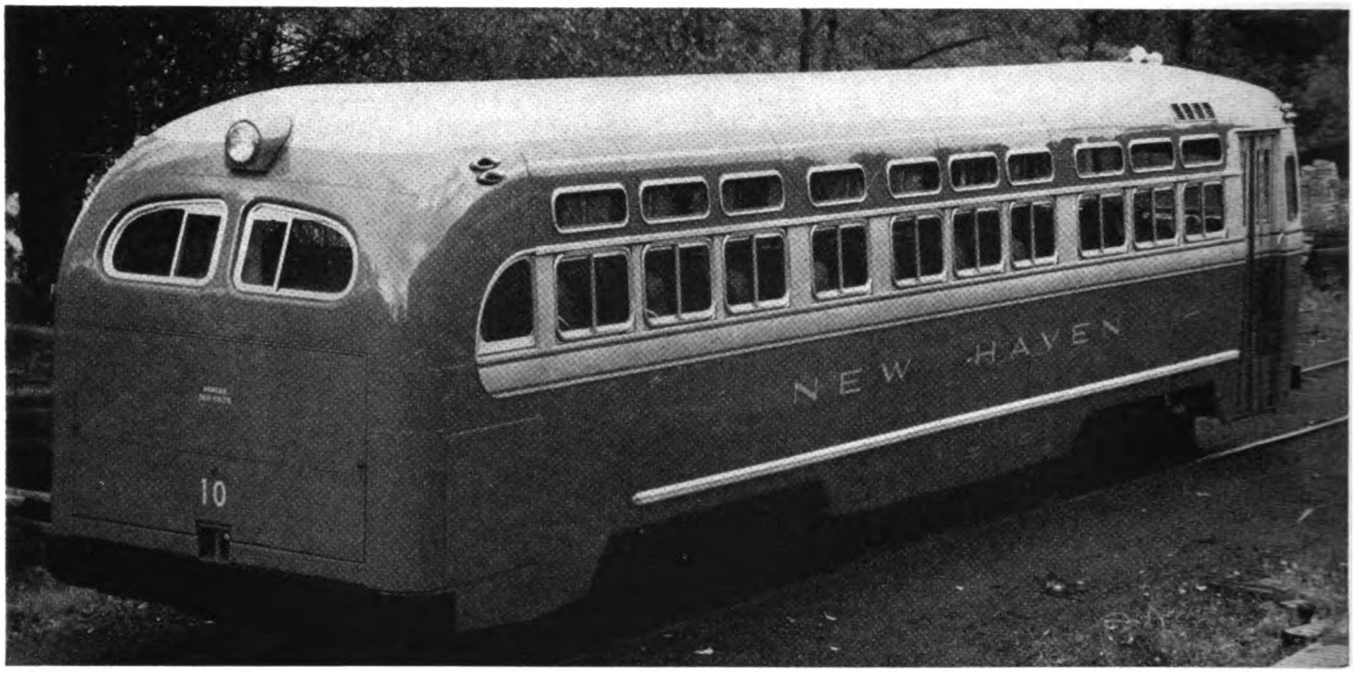
After the truck is stripped, parts are cleaned and inspected and defective parts marked for handling. The side frame is placed in the cradle, the top half being bolted in place. The cradle thus forms a trunnion resting on four flanged wheels which are mounted on two shafts that turn in Timken bearings.

One side of the trunnion has a fabricated gear. An air motor drives a chain of worm and spur gears that mesh in this fabricated gear and rotate the cradle and the side frame through 360 deg. This allows the side frame to be turned to any desired position, at which a latch holds it in place, enabling the mechanic to perform all work while standing upright.

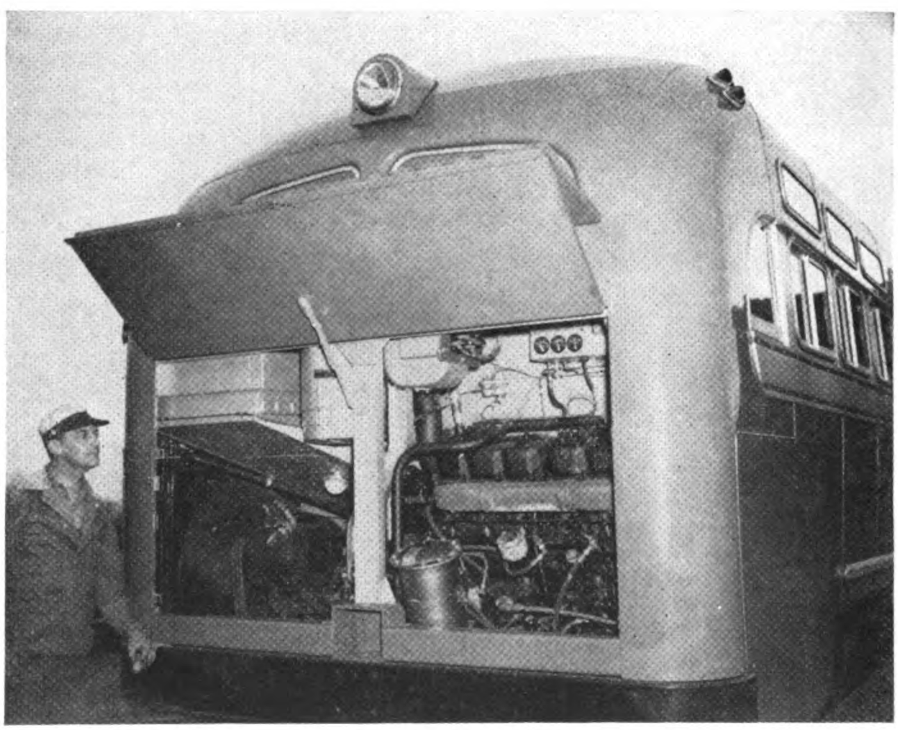
After all parts have been repaired and replaced, the side frame is rotated to the proper position for placing it on the wheels. The top half of the cradle is removed, enabling side frame to be lifted out and placed on wheels.



Cradle used in repairing the side frames of Alco 3-piece trucks

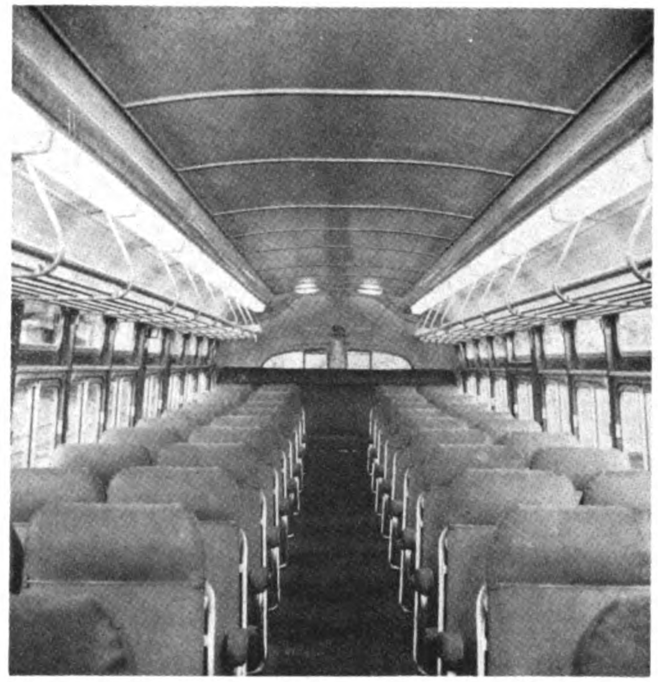


New Haven Tries New Rail Car

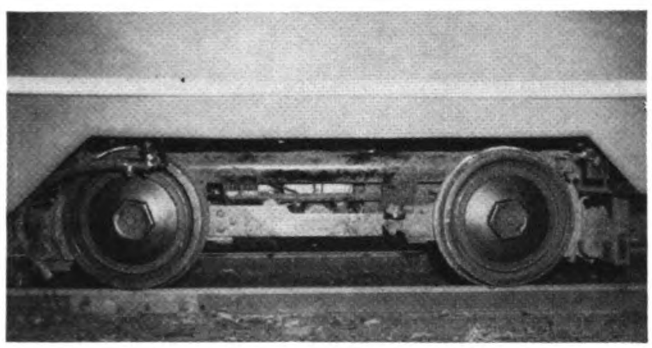


The power plant is cross mounted at the rear.

General lighting is furnished by two continuous rows of fixtures.



The seat at the rear is full width.



Resilient steel wheels insure quiet operation.

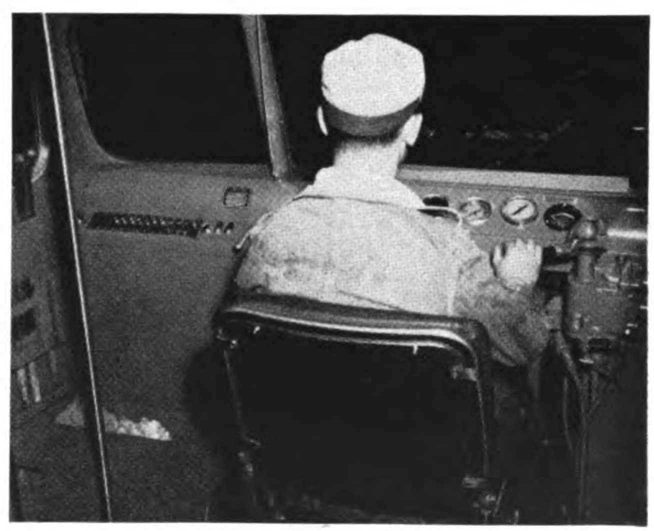
A DIESEL-electric rail car, known as the Mack FCD rail bus, designed to provide a means of handling light branch-line service economically for many railroads, is now in service on the New York, New Haven & Hartford.

Built by the Mack Manufacturing Corporation and equipped by General Electric, the car operates on a 17-mile stretch between Mansfield, Taunton and Fall River, Mass.

The car is an adaptation of the 50-passenger Mack bus used in New York City. It has a power plant consisting of a Mack 220-hp. supercharged diesel engine directly connected to a G.E. generator which, in turn, drives four 55-hp. G.E. traction motors.

The chassis is mounted on two four-wheel P.C.C. car trucks with one motor driving each of the four axles. Coil and rubber springing in the truck suspension, resilient steel wheels, hypoid motor gearing and resilient mountings for motors provide smooth and quiet riding and a high degree of rider comfort.

The car, which makes three round trips a day on each run, offers passenger service where none has been provided for the past 20 years. Since the service was initiated, the car has carried some 170 to 180 riders per day.



The operator's position is in the center.

How To Tonnage-Rate Diesels into a Few Groups*

By E. H. Weston†

While the problem of matching locomotives with trains according to tonnage is essentially one ultimately handled by the transportation rather than the mechanical department, there are means by which railway mechanical and electrical engineers can render valuable assistance by establishing scientifically a few tonnage rating groups into which will fall a large variety of makes and models of diesel locomotives.

In addition to the many varied types of main-line diesel road freight locomotives currently being operated, each year more special low-axle loading machines suitable for light rail and light track structures are announced. The six-axle, six-motor type of 1,600-hp. road switcher with a total weight around 290,000 lb. is the outstanding example of a current type of branch line locomotive.

These same six-axle, six-motor road switchers are also being ballasted to 360,000 lb. for heavy main-line drag service at low speed. In other cases, two or three 1,000-hp. switching locomotives with special gear ratios are being multipled for special heavy line drag service.

The impact of all these types of diesels on the railroads has resulted in no little confusion as to just which type is suitable for a specific service. Since railroad purchases of diesel power have for the most part been made slowly at first and then more rapidly, each railroad may have a number of different models of the same general type of locomotive from the same manufacturer. To add to the complexity of the situation, the operating people are given to understand that certain of these locomotives of the same horsepower cannot operate together in multiple on the same train because of differences in electrical equipment.

On many railroads there still is not a clear conception of the relationship of maintenance and operating expenses of diesel motive power as against the gross ton miles per freight train hour produced. The result is that on any given railroad the polyglot population of diesel locomotives are constantly being shifted from division to division in an effort to secure better utilization. If system timetables must patiently spell out tonnage ratings for every type of diesel by number for every subdivision, timetables will soon attain undue proportions and complexities.

The problem of tonnage-rating all the various types and makes of diesels for all sub-divisions of all divisions is a formidable task. Some means must be found to tonnage rate these machines quickly and safely with special emphasis on added train costs arising from stalling and doubling hills or simply overloading and damaging the electrical equipment.

In some cases tonnage ratings can be superseded by special agreements stating the duties a certain road job must encompass. Here switching moves and time on the road are the ruling considerations. Most train movements, however, are based simply on the principle of getting the greatest possible movement of tonnage per motive power unit.

Railway mechanical and electrical engineers can help in simplifying the tonnage rating situation. Ways and means do exist by which certain common denominators of performance can be developed for all types and makes of diesel locomotives. When a tonnage rating for a diesel is under consideration it is only natural to think of engine speeds near or at the continuous rating speeds of the traction motors. If the ruling grade is not too long, it may be that the tonnage rating is associated with a pulling force and speed slightly below continuous rating. In such a case engine weight on the drivers and limit of rail adhesion may be the common limiting factor of tractive force rather than electrical overloading.

These facts are indicated by the diagram in Fig. 1 which shows, first, the typical hyperbolic trace of attractive force-speed curve of a diesel electric locomotive and, second. the depressing effect of rail adhesion on the tractive force curve in the speed ranges below continuous speed.

The starting tractive force of the diesel electric locomotive set forth in Fig. 1, is assumed to be limited by a factor of adhesion of .25, or 25 per cent of the weight on driving wheels. This starting tractive force is further assumed to remain constant until a speed of 5 m.p.h. is approached. As the speed of the locomotive increases beyond 5 m.p.h., there is a very rapid deterioration in the factor of adhesion. The factor of adhesion drops as

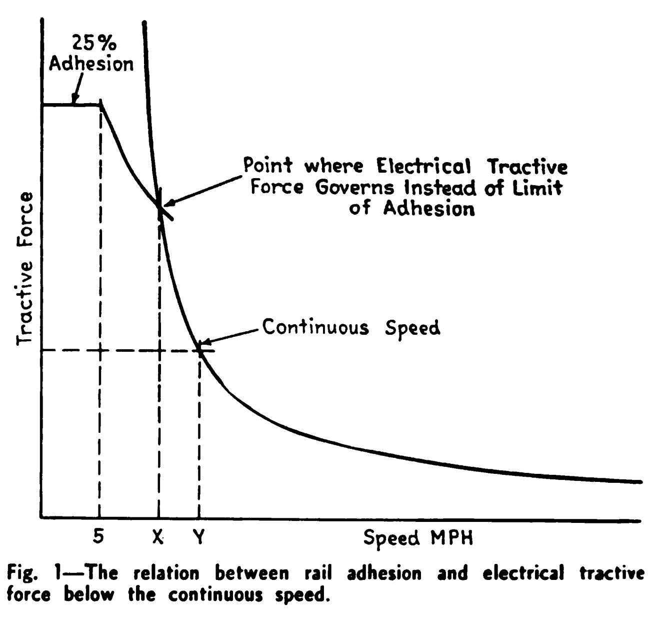


Fig. 1—The relation between rail adhesion and electrical tractive force below the continuous speed.

* Abstract of a paper presented at the A.S.M.E. semi-annual meeting June 15.
† Assistant chief mechanical engineer, Chicago and North Western.

the speed of the locomotive increases, but beyond about 10 m.p.h. the rate of decline in the factor of adhesion begins to moderate.

Generally in the vicinity of 8 to 10 m.p.h., the tractive force line representing the limit of rail adhesion of the locomotive drivers crosses the hyperbolic curve of electrical tractive force. The point of intersection of the curve representing the limiting value of rail adhesion and the curve of the electrical pulling force of the traction motors is indicated on Fig. 1 by the second vertical dotted line from the ordinate which intersects the abscissa at "X" miles per hour.

Thus, "X" m.p.h. in the case shown is the point where the electrical tractive force of the locomotive's motors limits the pulling effort of the machine instead of the limit of rail adhesion. At speeds greater than "X" m.p.h., the effective tractive force of the locomotive is truly represented by the typical tractive force curve published by the manufacturer.

In Table 1 are illustrated five types of diesel electric locomotives wit hthe weight on drivers of the five makes of machines varying from 233,000 to 287,000 lb. Locomotives A, B and C are of the four-axle, four-motor type, D and E are six-axle, six-motor type. The starting tractive force of each is limited to 25 per cent of the respective weights on the drivers and varies from 58,250 to 71,750 lb.

Column 4 indicates the maximum speed up to which the starting tractive forces act. Column 5 indicates the speeds at which the tractive force limited by adhesion equals the electrical tractive force of the traction motors. These speeds in Column 5 correspond to speed "X" miles per hour in Fig. 1. Column 6 states the continuous rated speed of each unit, and Column 7 states the tractive force associated with each continuous speed.

In lines D and E and in Column 5 the balance point of tractive force limited by rail adhesion and tractive force limited by the power of the traction motors occurs at a speed greater than the continuous speeds for the two locomotives as stated in Column 6. This is typical of most six-axle, six-motor machines weighing about 285,000 lb. on the drivers. For locomotives D and E in Table 1, the limit of adhesion fixes the maximum pulling force for all speeds up to and through the continuous rating speed; the machines designated D and E, will slip down on a grade before they will overload the traction motors.

Table 2 restates the designations of the five types of locomotives with Columns 1, 2 and 3 carried over from Table 1. Here column 4 indicates the basis on which the loading of the five types of machines being compared is estimated. The resistance in pounds per ton of car weight are based on a car weight of 50 tons gross load moving at the respective continuous speeds of each locomotive and traveling up a .77 per cent grade. The .77 per cent grade figure was selected because it was the best average ruling grade condition of all C&NW divisions radiating out of Chicago.

In Column 5 is shown the result of dividing the continuous tractive forces for each type of machine by the respective train resistances. The total train tonnages shown in Column 5 represent train consist that each locomotive could be expected to start from rest on flat and level track and to handle over various divisions around Chicago.

Columns 6 and 7 state the calculated elapsed time and distance needed by each of the five selected locomotives to arrive at their respective continuous speds on flat and level track when handling the tonnage indicated in Column 5.

TABLE 1 — CHARACTERISTICS OF THE THREE FOUR-MOTOR AND TWO SIX-MOTOR DIESEL-ELECTRIC UNITS

1		2	3	5	6	7
Loco. type	Wt. on drivers, lb.	Start. tr. force 25 per cent adh., lb.	Start. tr. force acts at max. speed, m.p.h.	Elec. tr. force-adh., m.p.h.	Cont. speed, m.p.h.	Cont. tr. force lb.
A	250,000	62,000	5	8½	10½	42,500
B	255,000	63,750	5	9	11	40,000
C	233,000	58,250	5	10	11	40,000
D	278,900	69,700	5	9	7½	59,000*
E	287,000	71,750	5	8	7¼	61,500*

* Limited by adhesion.

TABLE 2 — TIME AND DISTANCE TO ACCELERATE TO CONTINUOUS SPEED WITH RATED TONNAGE

1	2	3	4	5	6	7
Loco. type	Cont. speed, m.p.h.	Cont. tr. force, lb.	Train resis.* .77 per cent grade, cont. sp'd, lb. per ton	Cont. speed train on .77 per cent grade, tons	Accel. from rest to cont. speed: Time, sec.	Distance, ft.
A	10½	42,500	19.40	2,190	48	420
B	11	40,000	19.40	2,060	44	385
C	11	40,000	19.40	2,060	48	416
D	7½	59,000†	19.20	3,070	40	221
E	7¼	61,500†	19.25	3,200	39	208

* 50-to cars.
† Limited by adhesion.

From an examination of Columns 6 and 7 in Table 2, it is evident that locomotives A, B and C perform quite differently in the handling of their respective trains than do locomotives D and E.

Selecting Criterion Unit

Forgetting, for a moment, the specific train tonnages shown for each locomotive in Column 5 and just remembering that each of the five types of locomotives *is loaded in the same degree*, it is evident that for speeds from zero ton continuous, certain of the machines in Table 2 will group as far as train performance is concerned. In setting up the grouping on the basis of diesel locomotive performance figures as set forth in Columns 6 and 7, it is recommended that only these locomotives whose acceleration times and distances from

TABLE 3—THE CRITERION UNIT IS DETERMINED BY AVERAGING THE TIMES AND DISTANCES OF ALL UNITS IN EACH GROUP

Loco. type	Cont. speed, m.p.h.	Cont. speed train on .77 per cent grade, tons	Accel. from rest to cont. speed: Time, sec.	Accel. from rest to cont. speed: Distance, ft.	
A	10½	2,190	48	420	Group I units
B	11	2,060	44	385	
C	11	2,060	48	416	
	Average.......		46	407	
D	7½	3,070	40	221	Group II units
E*	7¼	3,200	39	208	
	Average.......		39.5	214	

* Criterion unit.

rest that can be contained within a range of 10 per cent from minimum to maximum be used as the basis for grouping.

Table 3 is a partial restatement of Table 2, but goes one step further in showing averages of train performance data for each of the two groups of locomotives. In the case of locomotives A, B and C, designated as Group 1 units, the averages of the three values of acceleration times and distances indicate that B is the criterion unit of the group.

In the case of D and E the averages of accelerating times and distances would not positively indicate which machine might be representative of that group. In this case the criterion unit might simply be selected on the basis of the number of each type owned by the railroad.

The method outlined in Tables 2 and 3 for grouping various types of diesel units is an attempt to average out locomotive performance facts in the speed ranges where tonnage ratings are generally determined. However, if a tonnage rating subsequently developed for the criterion engine in any group so selected and grouped on any ruling grade is applied to each of the other engines in the group, the resulting data on time over the hill and time running at continuous speed or below will not vary among any of the engines in the group by more than 12 per cent.

It is also a fact that using the criterion unit's tonnage rating for a group of locomotives will result in train performance statistics at speeds above continuous rating that will be almost identical for all machines in the group. In other words, to use the tonnage rating for a certain division as developed from a given criterion unit that was picked from a group of locomotives analyzed per above, will result in almost identical values of gross ton miles per freight train hour for all machines in the group.

Performance on Ruling Grades

After determining which one of a group of locomotives is to be the criterion machine of the group, it will, of course, be advisable to consider a certain ruling grade and develop a group tonnage rating for the grade. Fig. 2 indicates a typical grade over which tonnage ratings for each criterion units may be developed. The average grade is .72 per cent and it is approximately five miles, or 25,000 feet long.

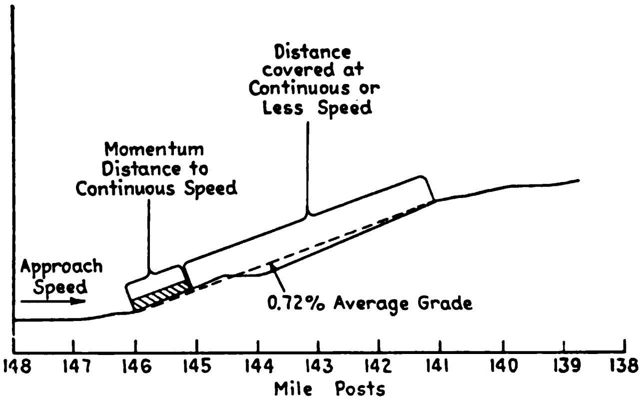


Fig. 2—The grade selected for determining the tonnage rating of the criterion units.

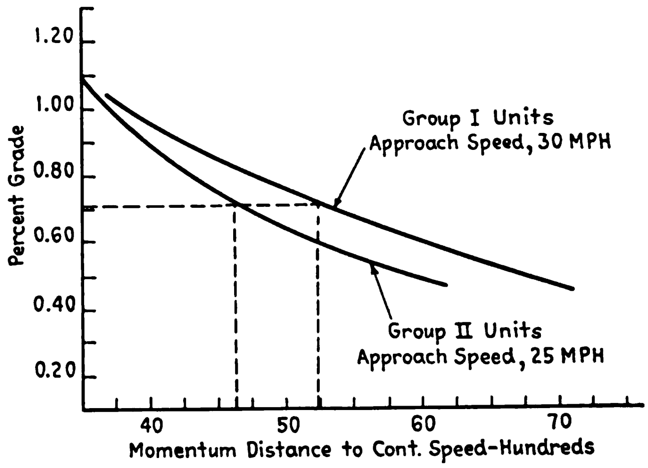


Fig. 3—Curve for determining the distance during which the train slows from approach speed to continuous speed.

Each criterion unit and train will approach the grade from the left at a certain speed. As the locomotive and train start up the hill, the momentum of the train will assist the locomotive in overcoming the initial effects of the grade for a short distance. Since the combination of grade resistance and speed resistance of the freight train cars is generally greater than the locomotive tractive force at speeds above continuous, the train speed decreases steadily as the train moves up the grade, until it eventually slows down to the continuous rating speed of the traction motors. The distance the locomotive and train run up the grade while at the same time slowing down from the approach speed to continuous speed is shown as a bracketed line labeled "momentum distance to continuous speed."

The remaining distance of the grade beyond this first bracketed length is that part of the grade that the locomotive and train will negotiate at the continuous speed of the locomotive or less, depending on the tonnage and on the steepness of the grade.

Fig. 3 suggests how the "momentum distance to continuous speed," might be quickly found. For each criterion engine in Group 1 or Group 2, a number of calculations were made, working backwards from certain

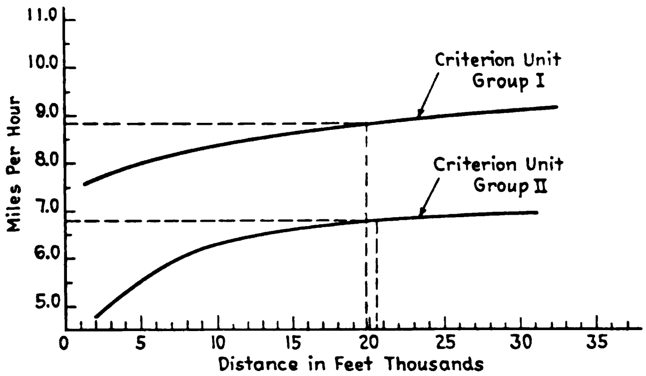


Fig. 4—Short-time traction motor ratings, showing the distances that can be safely covered at each speed.

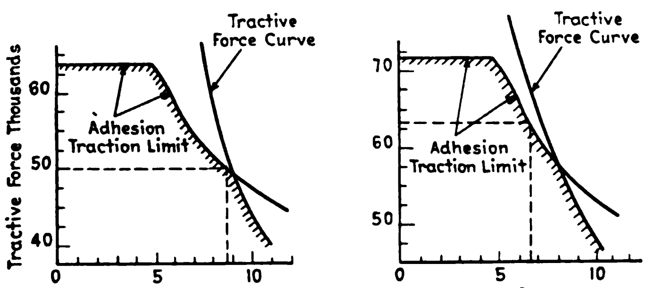


Fig. 5—Detailed low-speed portions of the tractive force curves for the two criterion units.

TABLE 4—HOW THE TOTAL TONNAGE AND ALLOWABLE CONTINUOUS GRADE AT CONTINUOUS SPEED ARE COMPUTED

Line No.		Group I units	Group II units
1.	Length of initial average grade, ft.	25,000	25,000
2.	Momentum distance on .72 per cent grade Fig. 3, ft.	5,200	4,600
3.	Net length of grade at continuous or less speed, ft.	19,000	20,400
4.	From Fig. 4, minimum locomotive speed, m.p.h.	8.8	6.8
5.	From Fig. 5 and Line 4: maximum tractive force, lb.	50,000	63,500
6.	Train resistance* per .72 per cent grade: speeds per Line 4, lb. per ton	18.30	18.20
7.	Maximum tonnage rating, Line 5 ÷ Line 6, tons	2,730	3,490
8.	Net trailing tons (Line 7 minus engine weight), tons	2,603	3,347
9.	Practical limit of trailing tons (90 per cent of Line 8) tons	2,340	3,010
10.	Continuous grade of continuous speed, per cent	.61	.78

Based on 50-ton cars.

train tonnages and given ruling grades to develop the data for each graphed line shown.

Fig. 3 is based on an approach speed of 30 m.p.h. for the Group 1 machines and 25 m.p.h. for the Group 2 machines. Outside of considerations for special slow orders or signals at the foot of certain grades that would require a train coming to a full stop, the approach speeds and resulting distances to slow to continuous speed for the various per cent of grades shown, are felt to be representative of average road conditions.

The Speed of Each Unit

Fig. 2 shows that the average value of the ruling grade under consideration was .72 per cent. Looking up the ordinate axis of Fig. 3 to .72 per cent and reading across to each of the group lines, it develops that Group 1 machines with their trains will slow from 30 m.p.h. to 11 m.p.h. on a .72 per cent grade in 5,200 feet, whereas Group 2 locomotives and trains will slow from 25 m.p.h. to 7¼ m.p.h. on the same .72 per cent grade in 4,600 ft.

Fig. 4 is a graph of the short time ratings of the traction motors for the criterion engines in Group 1 and Group 2. The data in Fig. 4 are generally supplied by the manufacturer in tabular form, but were put into the form shown by simply reading distance into the manufacturer's declaration of speed and allowable time in the overload zone. The closer the speed of the locomotive approaches its continuous speed, the greater the distance the locomotive will be permitted to run at that speed.

Going back to the problem in hand, from a consideration of the grade on Fig. 2 and the "momentum distance to continuous speed" found in Fig. 3 Group 1 locomotives will negotiate 19,800 ft., and Group 2 20,400 ft., of the grade at continuous speed or less. Reading up to the short time rating curve on Fig. 4 for each criterion engine, he finds that Group 1 units cannot travel slower than 8.8 m.p.h. and that Group 2 units cannot travel slower than 6.8 m.p.h. in traversing this grade.

Having determined the minimum operating speed for each criterion unit for negotiating the ruling grade without exceeding the short time ratings of the traction motors, the maximum pulling force each criterion unit will develop at these maximum speeds is considered.

Fig. 5 details the low-speed portion of the tractive force curves of the two criterion units. Superimposed on these tractive force curves are the respective limits of pulling force due to rail adhesion for each criterion unit.

The minimum speed of 8.8 m.p.h. on the ruling grade as calculated above is indicated and a vertical line is erected to the tractive force curve. For the case of the Group 1 machines the pulling force is 50.000 lb. and is limited by rail adhesion.

When the minimum speed point of 6.8 m.p.h. for Group 2 machines is found on the tractive force curve, a pulling force of 63,500 lb. results, limited again by rail adhesion.

From tables of car resistance at the minimum speeds for each of the criterion units plus the equivalent resistance of grade, a total figure of train resistance is found. Dividing the total train resistance figure for each group of units into the respective maximum pulling forces gives the total train tonnage that can be moved over the grade without exceeding the short time ratings of the motors or exceeding the limits of rail adhesion.

Determining Rated Tonnage

Table 4 outlines how the above calculations and graph readings might be handled to arrive at the total train tonnage. Line 7 indicates the total train tonnage for each group of machines. Line 9 suggests that 90 per cent of the maximum train tonnage figured above be used for the published tonnage rating. The 10 per cent cut from the calculated maximum tonnage allows for uneven track conditions that might further depreciate the rail adhesion factors; for the effect of wind on a broken consist train; for a possible high proportion of empty cars to loaded cars, thus increasing temporarily the specific train resistance per ton of weight; and finally for the fact that the mechanical and electrical condition of all freight diesel electric locomotives is not always up to standard.

Line 9 then indicates the practical limit of train tonnage that may safely be handled by all Group 1 and Group 2 locomotives.

Line 10 develops an interesting point. If each criterion engine were loaded down with the train tonnage outlined in Line 8 and then run at full power at its continuous speed, it would be able to negotiate a certain grade for an indefinite time. The per cent of grade over

which this indefinite period of operation would result is indicated in Line 10.

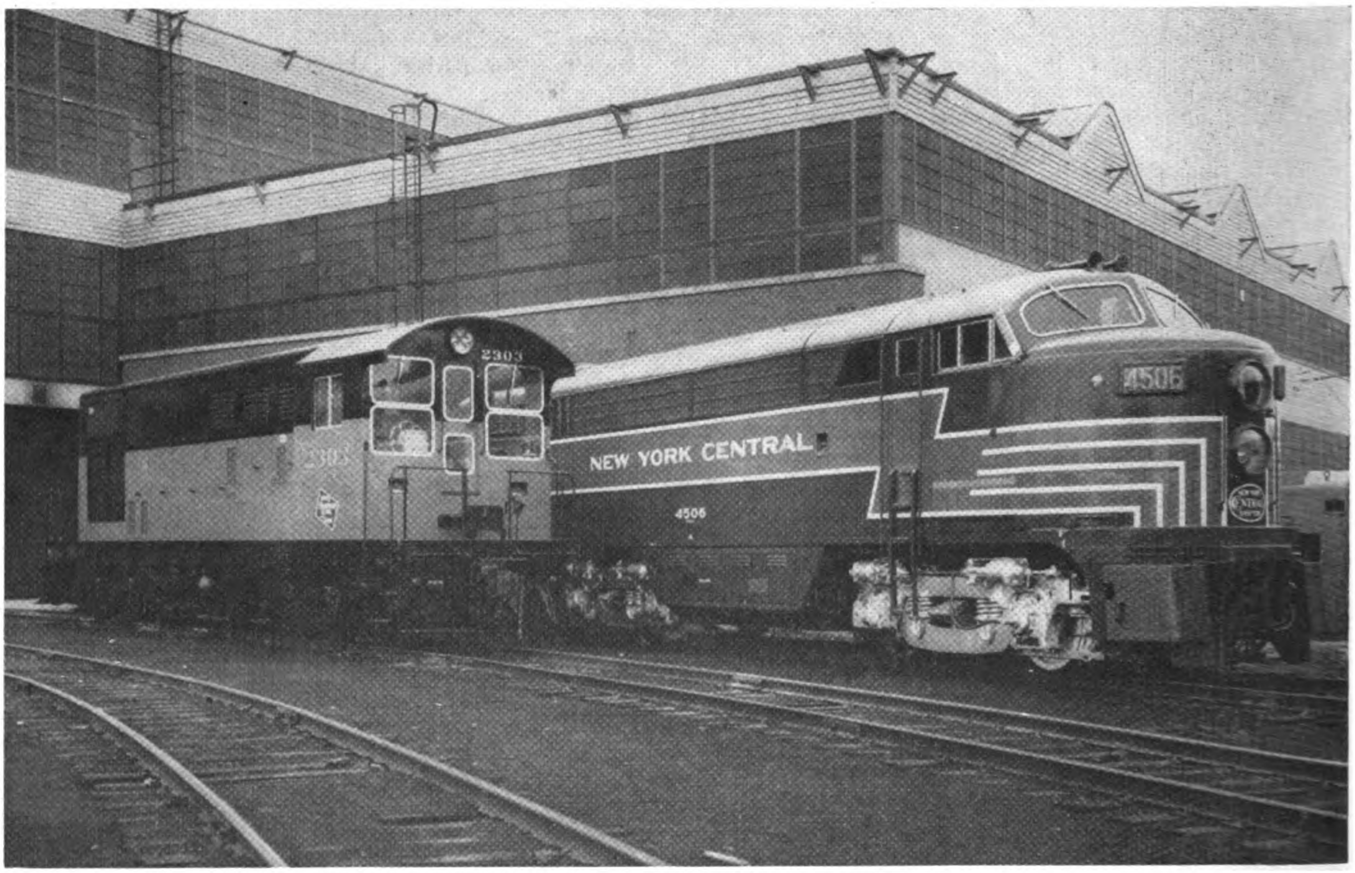
A re-examination of the track profile for the division over which the above tonnage rating was determined, might then be made to see just where and by what amount any other grade on the division might exceed this continuous speed grade. A check can thus be made on the original selection of the ruling grade for the division. Perhaps another spot will turn up where the criterion machine will go into its short time rating. But with a set of critical distances and speeds already worked out for a given train tonnage, the new grade condition can be quickly judged as to importance.

Aside from the advantage of being able to examine quickly the effect of various grades on a division on a large group of locomotives, other questions can be answered with equal ease. For instance, the shorter the ruling grade over which a tonnage rating calculation is carried, degree of grade being equal, the heavier the locomotive may be loaded. In other words, the effect of train momentum is relatively more important in rating a locomotive on a short grade because the remaining distance the locomotive must run to clear the crest of the hill is much shorter and hence the locomotive can safely dip more deeply into the short time rating of its traction motors. From the particular grade condition in hand, plus a consideration of Figs. 3 and 4, allowance may be made for the shorter grade with a lesser full load locomotive speed assigned thus giving a higher short time tractive force.

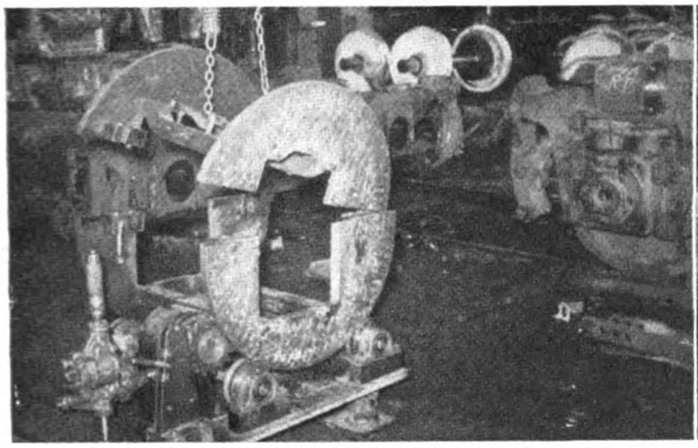
From the practical standpoint the indicated method of grouping diesel locomotives, where formal tonnage tests do not exist, can assist in arriving at general agreements with the operating people while at the same time allowing the machines to be worked to a safe maximum.

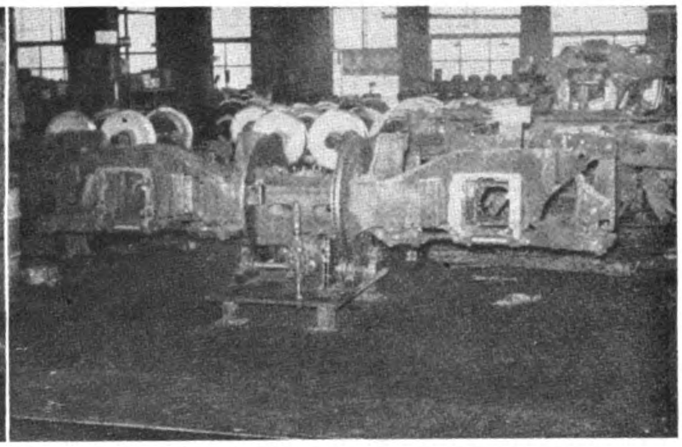
Further, a system of grouping diesel-electric locomotives on an equal performance basis simplifies the selection of engines to be multipled together. A method of grouping diesel units into tonnage rating groups regardless of manufacturer, model, weight on drivers, or continuous speed, is valuable in selecting those that might evenly share train load when working together.

Finally, if it occasionally becomes necessary to mix diesel units of two different groups together on a train, a system of grouping would immediately indicate that the lowest group rating machine should lead the train and that the train tonnage should be only multiples of the rating of the lowest unit.



Two diesel locomotives recently turned out at the Beloit Works of Fairbanks, Morse & Co. The larger, one of two twin units, was built to haul the New York Central streamliner, James Whitcomb Riley, between Chicago and Cincinnati. The smaller unit was delivered to the Milwaukee for switching cars in one of the system's freight yards. Eight of the big C-line passenger units, powered by 2400-hp. opposed-piston engines, were delivered to the NYC in March, and twelve C-line freight locomotives to this railroad during the first quarter of 1952. The switcher is powered by a 1200-hp. opposed-piston engine.





EMD truck-repair stand (left) empty and (right) supporting truck at a convenient level for inspection and repair work.

Truck Lifting Device And Repair Stand

The illustrations show a truck-lifting device and a repair stand successfully used in reconditioning EMD diesel locomotive trucks at the San Bernardino, Cal., shops of the Santa Fe.

The first device is an arrangement for lifting trucks in and out of the lye vat. The tapered center portion goes into the truck center casting and acts as a guide to line the device up central. Uncoupling is accomplished automatically simply by lowering the crane, which trips a latch on the vertical sliding center stem.

In immersing a truck in the lye solution, the crane and the carriage are both set to predetermined marks. When the truck is to be lifted out, the crane and the carriage are set in the same position. The lifting device is placed in open position and lowered onto the truck. When the taper portion hits the center casting, this trips the latch and the device closes in and takes hold underneath the traction motor supports.

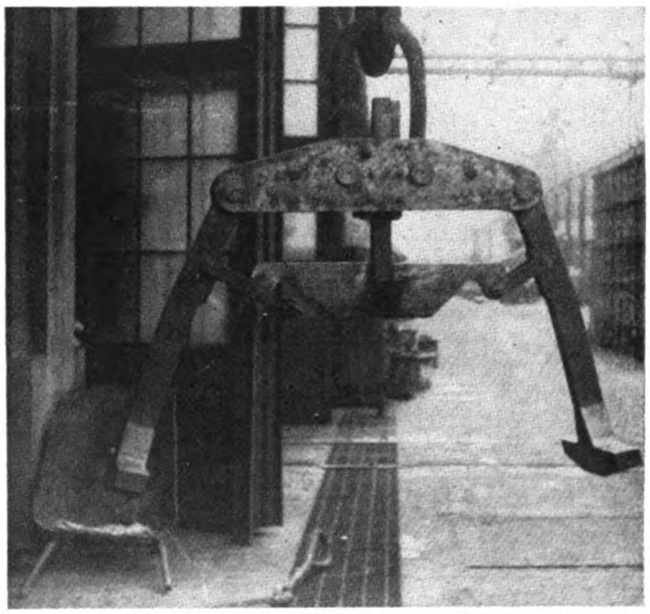
After being thoroughly cleaned, the truck is placed on the repair stand and clamped in place with screw clamps at all jaws. Hydraulic jacks are then placed under the journal box spring pockets and raised to clear the pedestal jaw liners. Impact wrenches are used to loosen and tighten the liner bolts. Worn liners are turned or replaced. Broken coil springs are replaced at this time. The jacks have sufficient lift to lower the pocket so that the top of the spring is below the frame.

If the spring plank or the leaf springs require attention, a 50-ton air jack is located on a base under the center of the truck. On this base are hinged two yokes that swing over the lower traction motor supports, front and back. The jack then raises the spring plank, compressing leaf springs until the spring hangers are free to swing out and up to clear the springs where they are held with a special holding device. The jack is then lowered until the spring plank rests on four rollers that allow the plank with springs to be rolled out either side of the truck. Springs, whole or partial, can be lifted off with a wall crane.

If spring hanger bushings are to be replaced, a special hydraulic cylinder is used which will pull out the old bushings and press in new ones. To operate the hydraulic equipment, an air pump is used which can furnish air up to 2,000 lb. per sq. in.

Brake hanger bushings are removed and replaced with an air hammer. Repaired brake hangers are lifted in place with the wall crane.

Journal boxes are placed on the journals and the wheels rolled to the wheeling track where the wheels go into position at correct spacing. The truck is lifted off the stand and set on the wheels, then being moved forward to receive the binders and traction motors.



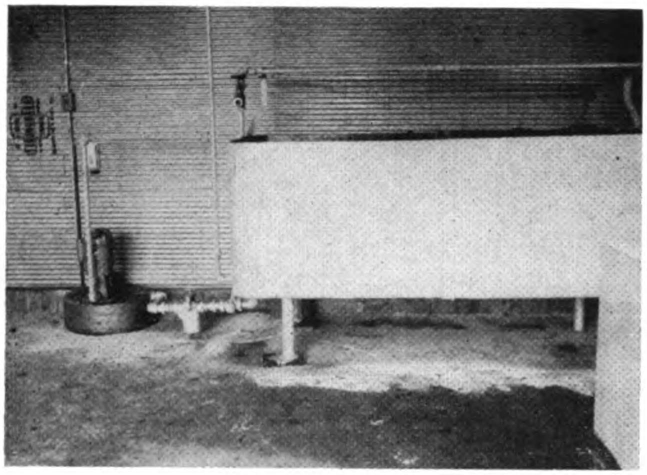
Lifting device which automatically engages EMD truck while submerged in lye vat.

Automatic Waste Oiler

The Toledo, Peoria & Western has solved the problem of keeping its stored journal box waste properly oiled without need for manual attention by the use of an ordinary household sump pump.

The sump pump, with typical float switch operation, makes an excellent arrangement for keeping the waste oiled. When the waste is put in the bin, it has the proper amount of oil. As this oil begins to settle out it drains into the sump, causing the float to rise and trip the starting switch, thereby putting the oil back in the waste.

The oil is distributed evenly over the waste through



Connecting the waste storage tank to a sump pump with a float switch makes completely automatic the continued reoiling of stored waste.

two lengths of 1¾-in. pipe in which is drilled 5/32-in. holes 30 degrees from the vertical center line and 3 inches apart. The two spray pipes are 8 in. apart. The oil is delivered at the middle of this length of pipe through a tee by a third pipe; the delivery pipe is located half way between the two spray pipes. The three pipes are mounted one foot above the top of the tank.

The return line from the bottom of the tank to the pump is 1¾-in. pipe. A small cylindrical wire mesh filter is located half way between the tank and the sump. The tank itself is 30 in. by 84 in. by 28 in. deep, and has a steam coil for keeping the oil warm. The tank rests on four 2-in. tubes, and the pipes are supported by strap iron ¼ in. by 1¼ in.

A drain line of 1-in. pipe fitted with a valve is included in the delivery line for draining off excess oil. The spray pipes are closed at the ends by pipe caps to permit easy cleaning out.

Decisions of Arbitration Cases

Explosion Damage to Leased Car at an Industrial Plant

In an explosion and ensuing fire at Texas City, Tex., on April 16, 1947, tank car UTLX 96189, located in plant at Monsanto Chemical Company suffered practical destruction. The car had been moved into Texas City by the T&NO and physical placement on track in Monsanto plant was performed by Texas City Terminal Railway which does the switching for the several railroads at that point. As the car was under lease to Anchor Petroleum Company when destroyed, they authorized the owner, Union Tank Car Company, to bill them for its A.A.R. depreciated value, which amounted to $6,980.05 and settlement between them was negotiated on that basis. In August, 1948 the T&NO received Anchor Petroleum Company claim No. 01-07-501 in amount of $6,816.83 covering loss of this car. The difference between amount of this claim and the depreciated value represented a salvage credit allowed Anchor by Monsanto who had been authorized by Union Tank to dispose of wreckage. The credit amounted to 55 per cent of the net A.A.R. Salvage value. The T&NO contended that provisions of the A.A.R. Code of Rules Governing the Condition of, and Repairs to, Freight and Passenger Cars for the Interchange of Traffic do not make them responsible to Anchor for the loss of the car and the road therefore declined Anchor's claim.

In a decision rendered June 23, 1952, the Arbitration Committee ruled that "Under the provisions of Rule 113, Par. (1), the T&NO was responsible to the car owner for settlement for destruction of the car.—*Case 1838, Texas and New Orleans versus Anchor Petroleum Company.*

Responsibility for Flood Damage

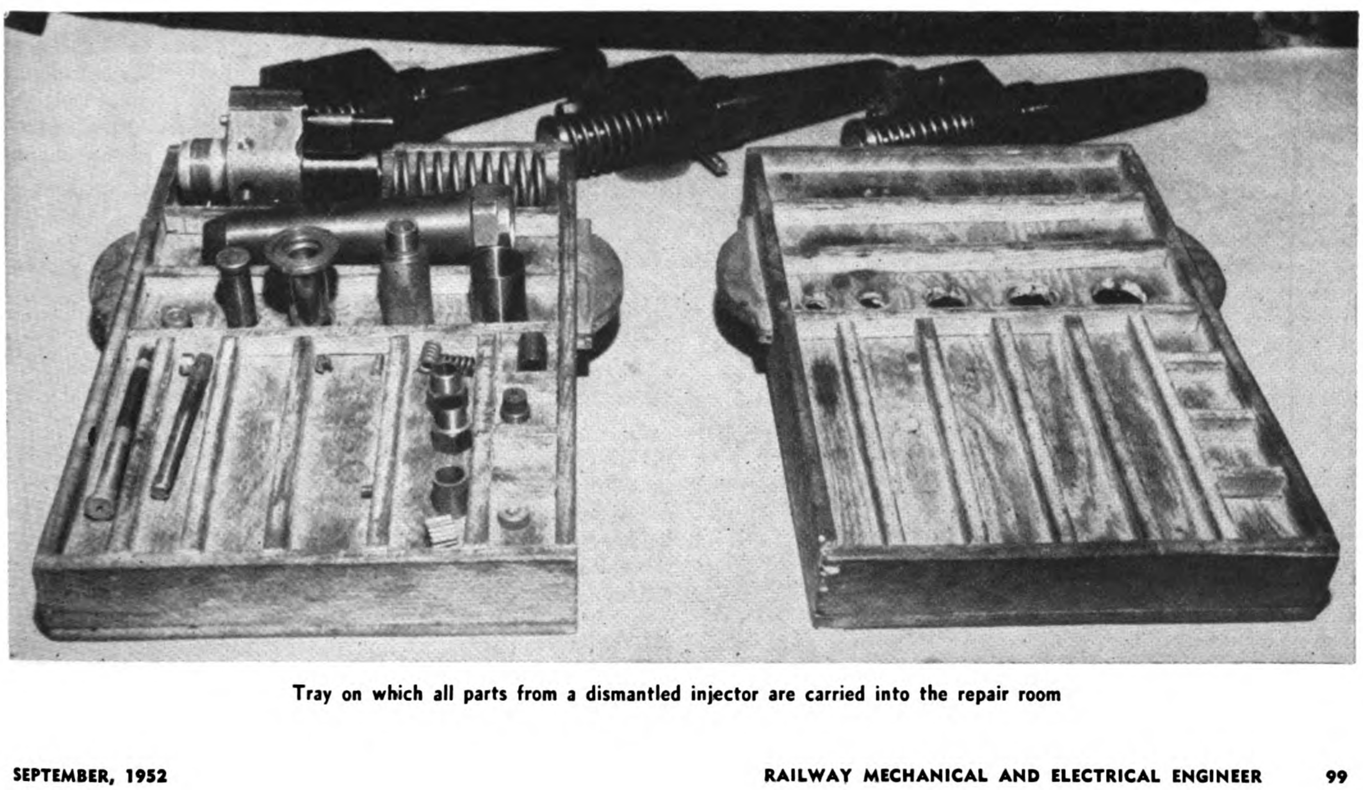
Thirty-five refrigerator cars owned by Merchants Despatch were damaged by flood waters at Kansas City, Kan., and Kansas City, Mo. between July 12 and July 16, 1951. The cars were at five different locations: (1) a dock track, part of which is owned by the Kansas City Southern and part by the Central Packing Company, with the company's portion maintained by the railroad for a fixed charge of 10 cents per foot per year in accordance with an Industry Track Agreement (ITA); (2) a KCS company track, also covered by an ITA and jointly owned and maintained on the same basis; (3) and (4) two tracks owned by KCS (called tracks 1 and 2) with use thereof covered by an ITA on which the packing company assumed no part of the maintenance; and (5) a KCS yard. The KCS contended that all of the flood-damaged cars were leased to Central Packing Company, within the meaning of Rule 113; that the tracks on which the flood-damaged cars were located at the time of submersion were either owned or were exclusively assigned to the Central Packing Company for use in its business; that the ITA covering dock track, KCS company track and tracks 1 and 2 constitute leases to the industry (within the meaning of Rule 113) of the portions thereof not owned by industry; that the cars were "home" on these tracks and also when in the yard by reasons of inability of the industry to receive them on the other assigned tracks. The KCS contends, therefore, that in accordance with the proper interpretation of Par. 1 of Rule 113, the railroad is not responsible for damages occurring to said cars leased by Central Packing Company, while so located. Merchants Despatch contended that the 35 cars were in the possession of the KCS; that the exception in Par. 1 of Rule 113 does not apply; and that the term lease used in Rule 113, Par. 1, is not intended to include a so-called lease of the kind, for the purpose and of the intent of the one in question under which Merchants Despatch furnished cars for the service of the Central Packing Company. Merchants Despatch therefore, contends that the KCS is responsible for the flood damage to said cars in accordance with Rule 32, Par. (10-1).

In a decision rendered June 23, 1952 the arbitration committee ruled that flood damages are handling line defects under Par. (1) of Section (10) of Rule 32. The 35 MERX cars were in the car account of the KCS at time damaged by flood. Tracks other than the dock track were not considered as leased to the Central Packing Company. Therefore, the KCS was held responsible for the flood damage 31 cars sustained while in its possession, as provided in Par. (1) of Section (10) of Rule 32. However, according to the exception in Par. (1) of Rule 113, the KCS was not considered responsible for the other 4 cars damaged while on the dock track as this track was owned by the lessee of cars.—*Case 1837, Merchants Despatch Transportation Corporation versus Kansas City Southern.*

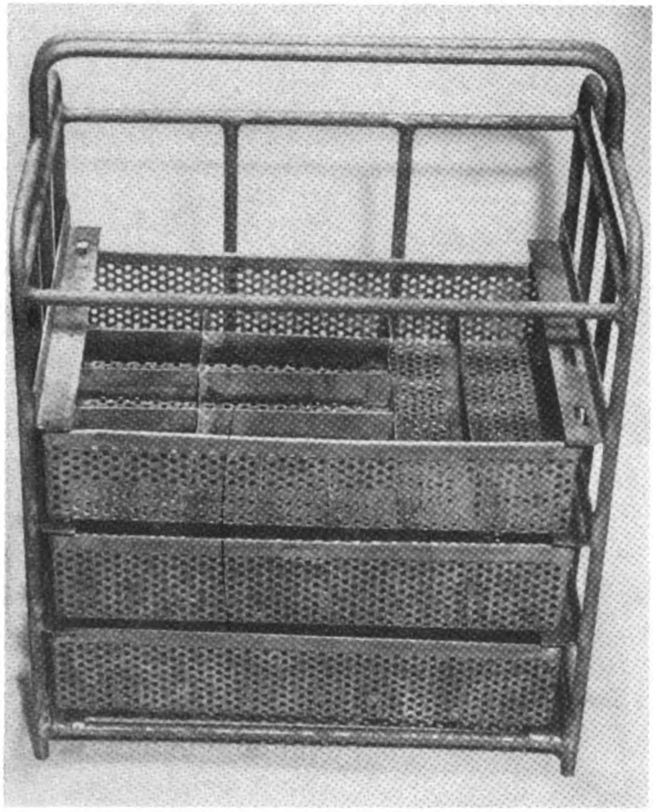
A corner of the pressurized room for reconditioning injector nozzles and governors. Completed nozzles are stored in metal containers on the open shelves at the left while parts are stored in the glassed-in cabinets on the right, and the workbench has a swinging tray

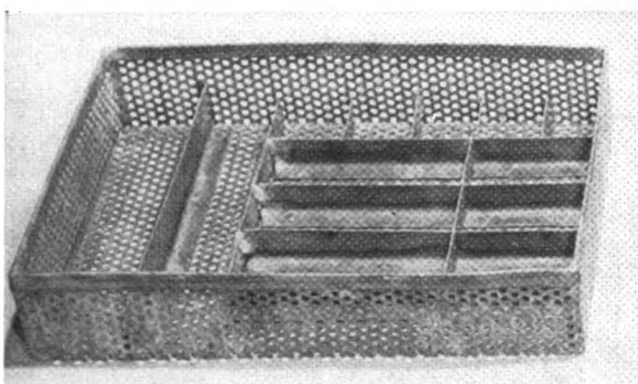
Injector Nozzle and Governor Test Room

The Pegram shops of the Southern at Atlanta, Ga., has a room about 16 ft. square and $7\frac{1}{2}$ ft. high devoted exclusively to repairing and testing diesel engine injector nozzles and governors. The room is completely enclosed to keep out dust, and the air within it is maintained at a pressure sightly above atmospheric by a blower driven by



Tray on which all parts from a dismantled injector are carried into the repair room





A group of the baskets in which injector parts are placed for cleaning

a 1/6-hp. electric motor. It is heated in cold weather by electric coils in the outlet stream of the blower, and is cooled in warm weather by circulating ice water through piping likewise located at the exhaust side of the blower.

Equipment in the room includes test racks for injector nozzles and governors, glassed-in storage cabinets along two of the walls, storage benches for completed governors, and a work bench for injector nozzles. The latter is fitted with the necessary drawers for small tools, with two air hoses for blowing parts dry, and with a container for mineral spirits. The container is normally located under the bench completely out of the way, but is mounted so that it can be swung free of the bench when in use. The bench also has a magnifying glass with fluorescent lighting for close visual inspection of small parts.

The reconditioning of injector nozzles begins outside the special room with dismantling, cleaning by dipping first in a commercial solvent (Turco) and then in mineral spirits, and delivery to the enclosed repair area in a specially built small wood tray that holds all parts of the disassembled injector. Any final cleaning required is given to the parts one at a time in the swinging tray with mineral spirits and small stiff brushes. All parts are inspected visually, using the illuminated magnifying glass where necessary, and replaced when defects are found. The check valve spring is always replaced. The only exception to this is where the injector is not dismantled but, tested only as in cases where a head is replaced for a leaking seal. Injector nozzles from such heads are pop-tested, and if found satisfactory, are not dismantled.

Lapping is done on two of three plates. One contains crystalline alumina as an abrasive. The surface is kept perfectly clean and is used for polishing. The third plate is a spare. Once each week the plates are reconditioned by grinding them together. When lapping is completed, the injector nozzle is assembled and put on the test rack.

After checking for proper spray on the rack, and to see that the nozzle pops between 700 and 1,200 p.s.i., the pressure in the line is allowed to drop to 1,000 p.s.i. An electric timer, graduated in seconds and tenths of a second, is started at 1,000-lb. pressure. To meet specifications for satisfactory secondhand nozzles, the pressure drop must not exceed 600 p.s.i. in 35 seconds. The glass container which catches the spray is removed and the nozzle tip and the rack seal checked for dripping and leaks. The completed nozzles are stored in metal containers on open shelves along one side of the room.

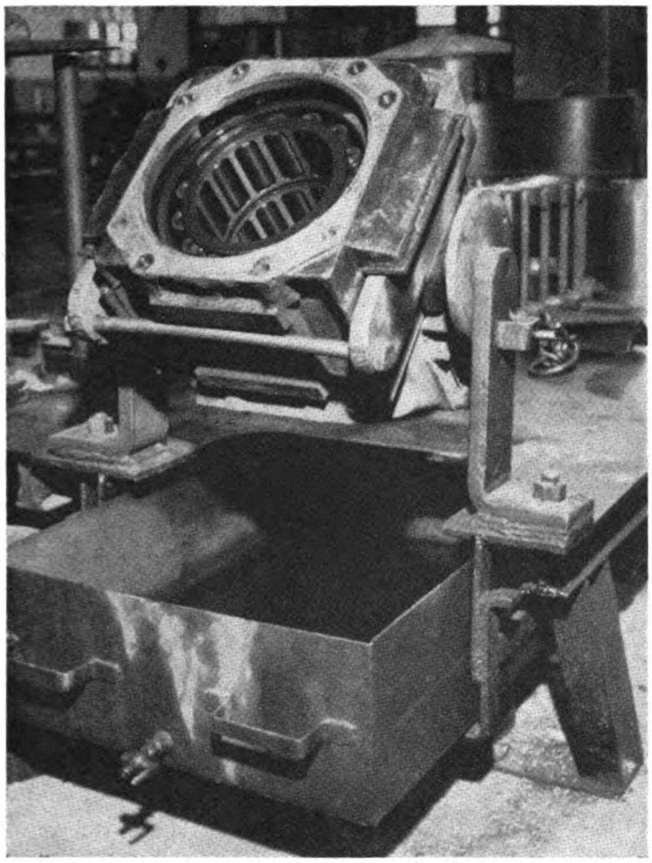
The bench on which the injector nozzles are tested has two shelves behind the doors on the bottom. These hold wrenches, tubing with fittings for application to the test rack, a pail for oil, and adaptors which make the bench suitable for testing injectors from any make of diesel engine. A bowl-shaped receptacle is stored under the bench to catch the oil from the nozzle that runs out when it is removed from the test rack. The right side of the bench has a Bendix-Scintilla fuel injection pump, the timer is in the center, and an E.M.D. pop tester is on the right. The top plate of this has been modified to permit, with the proper adaptor, the testing of several types of nozzles. Two tanks are located in the rear of the upper half of the test rack. One contains fuel oil and the second rust preventive for filling the completed injector.

Governors are dismantled inside the reconditiong room, but cleaed with mineral spirits outside the room. Both oil seals are renewed, and worn parts are replaced. After assembly the governor is tested for movement of the pilot piston on a Woodward test rack, which is equipped with an air motor and a means for applying a load to that motor. Completed governors are stored on a bench with the lower part fitting into 4-in. holes in the bench to hold the assembly securely.

Stand for Washing Roller Bearing Boxes

Diesel locomotive roller bearing boxes are cleaned quickly and thoroughly with the aid of a mounting stand developed at the C. & E. I. Oaklawn shops, Danville, Ill. The stand is built of heavy steel plate, and it positions and locks the box in any of several convenient positions. The cleaning solvent is contained in a sliding drawer directly underneath the stand.

The first step in the overall cleaning operation is the removal of the rollers and races, one individual part at a time to avoid reversing the position of any member. After



Holding stand and solvent drawer for cleaning diesel roller bearing boxes

these parts are cleaned in the solvent drawer, the box is cleaned in position on the stand and reassembled. The dirty solvent is drained when necessary through a pet cock near the bottom of the drawer.

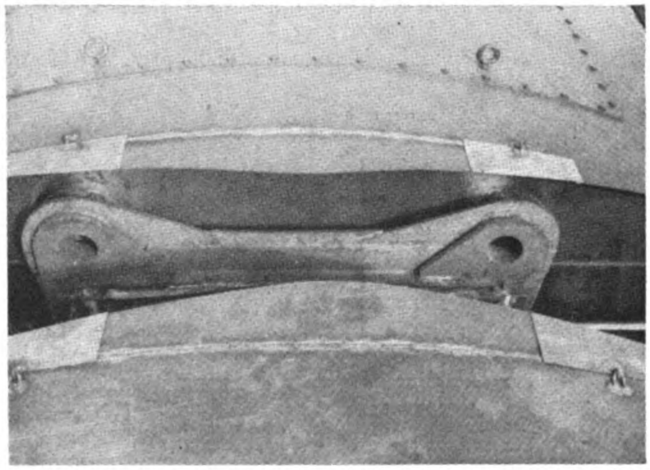
Lifting Diesel Units

The lifting arrangement illustrated is used to facilitate wheeling Santa Fe diesel locomotive units while in shop or lifting them in case of derailment.

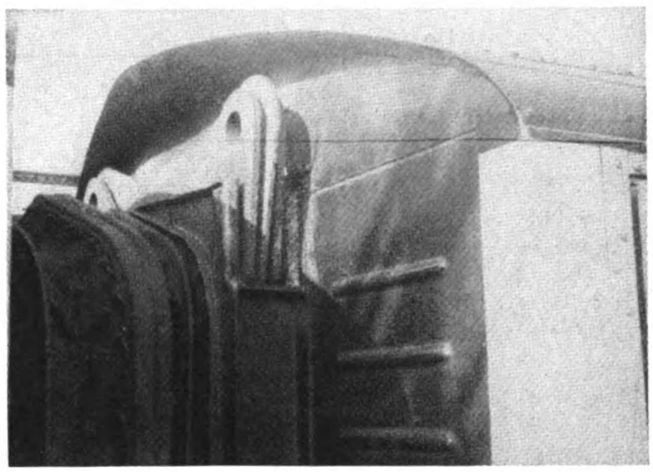
The fabrication consists of laying out, burning and forming the component parts of the lifter. The different pieces are then assembled on a jig and tack welded together. After removing from the jig, the welding is completed. They are then sent to the machine shop for machining pin holes for the lifting or sling pins. While welding, the lifter is thoroughly peened, then being further stress relieved in a furnace.

Lifters are applied to the square ends of diesel units at the top ends of crash posts. A section of the overhang of the roof is removed and saved for reapplying, as illustrated. A hole is cut in each side of the end sheets in line with where the pin hole in the lifter will come so that the lifting pin can be readily applied from inside the unit, the pin nut being applied from the outside. Hinged flaps cover these holes when not in use. The lifter is then placed in position and the plug and fillet welded to the crash posts. All welds are thoroughly peened during this welding operation. The section of roof overhang is then reapplied, leaving two hinged flaps, which are over the pin holes, so that the cables and clevices can be hooked up. With these flaps down in place, the unit has its original shape and the lifters are not noticeable.

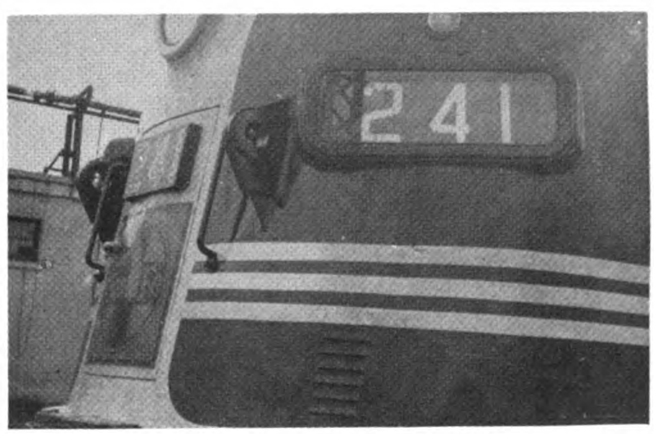
In applying lifters to the nose ends of units, the covering of the hood frame is slotted and a lifter is welded close to the top of each of the two main crash posts in three pieces. One piece is butt welded to the post; the other two pieces lap the first piece, one on either side of the post, and are plug and fillet welded to the post and to the first piece, forming one solid lifting eye.



Application of two solid lifting eyes to the nose of a diesel locomotive unit on the Santa Fe.



How a lifter is applied to the square end of a diesel unit.

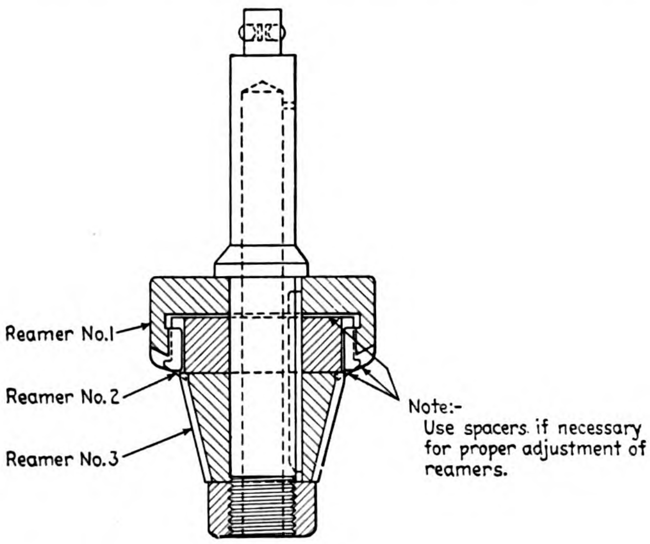


How roof ends are cut away and reapplied after lifters are installed.

Modified Drill Press Reconditions Heads

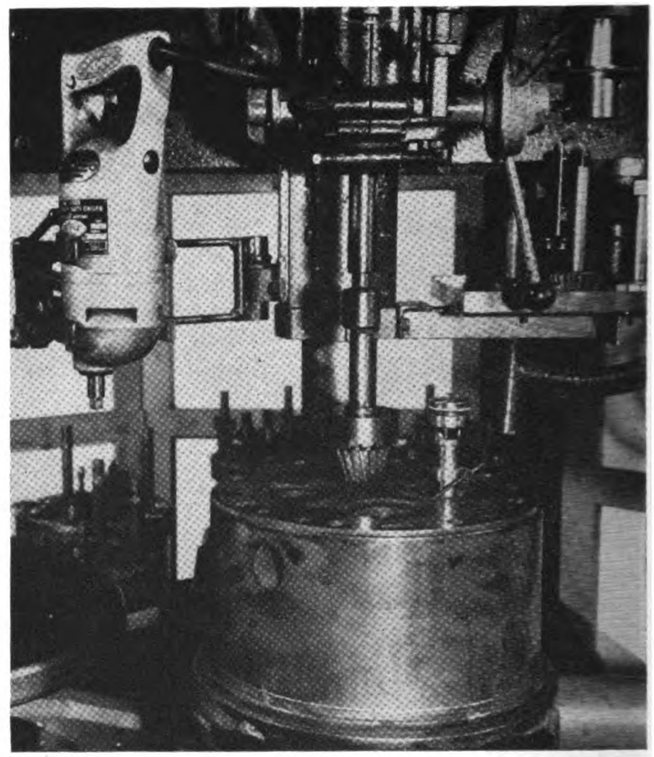
The Southern's shop at Chattanooga, Tenn., has modified a conventional Delta 36-in. drill press for reconditioning valve seats in diesel engine heads. The principal modifications comprise an arrangement for rapidly positioning the heads, a movable electric grinder, and a reamer which handles three operations with a single setup.

The head is positioned on the drill press by four



Details of the special reamer

Modified drill press for reconditioning Diesel cylinder heads



Cutting the seat clearance with three-cutting-head reamer

dowels. Slots cut in the machine base accommodate the positioning lugs. After the head has been secured in place a guide rod is inserted in the valve stem hole, and a special reamer is inserted in the chuck. This reamer has three cutting heads and performs three operation in one pass—cutting the seat clearance, cutting the seat, and reaming the exhaust port. Where the second operation, or cutting the seat, is not required, a second type of reamer is employed without the seat cutting section. In such cases the seat is merely ground.

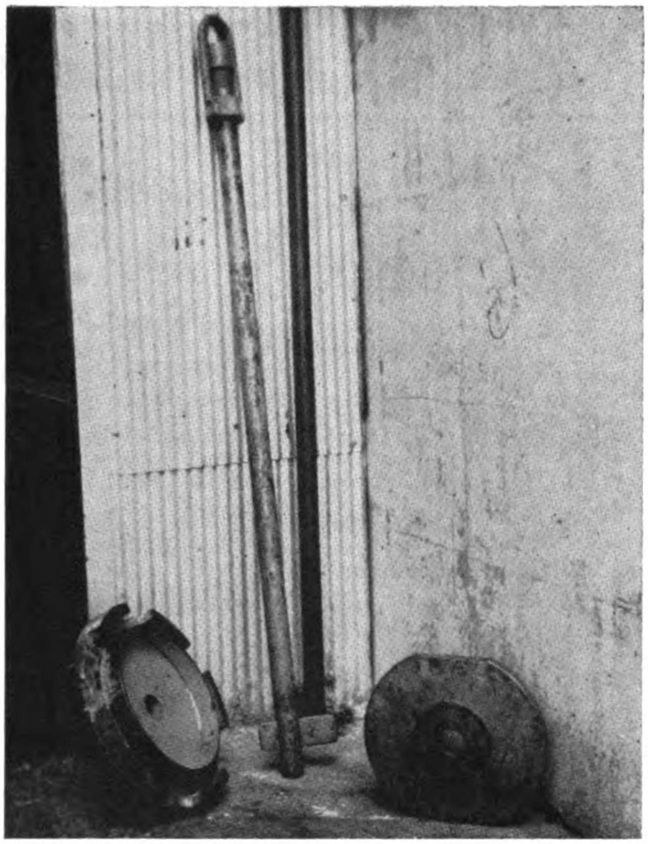
The seats are finished with form guiding wheels, which run on the same guide used for the reamer. The grinding wheels are mounted on a Sioux No. 1703 heavy duty grinder which revolves at 10,000 r.p.m. The grinder is affixed to an arm which permits movement in any direction, and is spring mounted to this arm for vertical movements.

The head stand is self-locking in any one of four positions, putting the valve guide directly under the drill press spindle. Release is by foot lever.

Applies-Removes Baldwin Liners

Liners on Baldwin locomotive engines can be easily applied or removed with an arrangement built by the Santa Fe at Argentine, Kan. The device consists of three parts, two plates and a long bar, and is used with a hollow-shaft hydraulic jack for either operation.

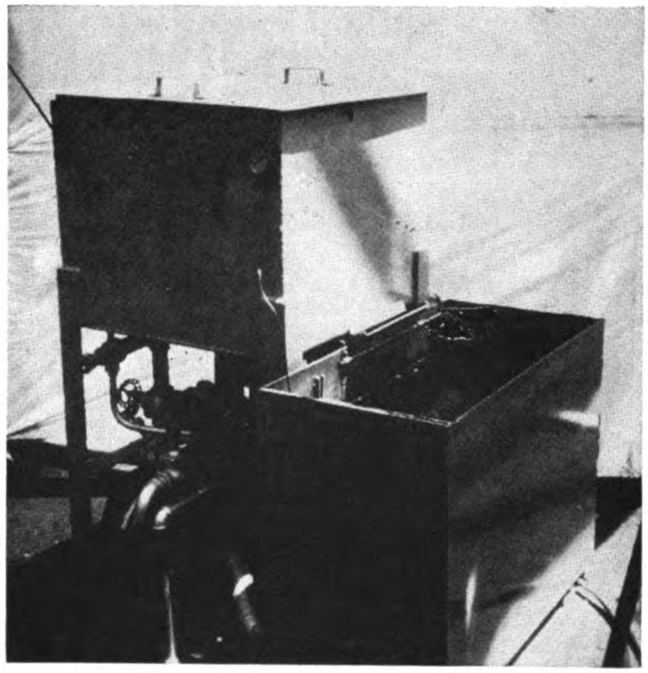
Referring to the illustration, the plate on the left fits on top of the cylinder while the one on the right fits under the liner. The long bar goes through the holes in both plates. The hollow-shaft jack slips over the top of



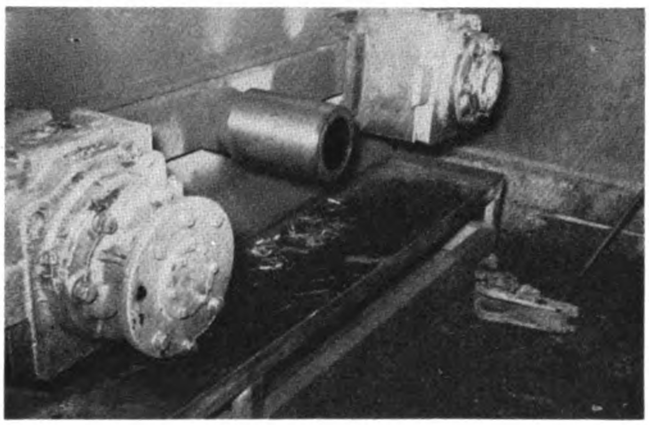
Arrangement used with a hollow-shaft hydraulic jack for removing or applying Baldwin liners

the bar, with the rod fitting through the shaft, and a key slips into a slot near the bottom of the bar directly underneath the bottom plate. The top nut of the bar is put on and turned until it contacts the jack shaft.

With the jack shaft pushing against the top nut of the bar the liner can be lifted the first two inches, after which it is free. During this initial 2-in. lift to free the liner from its snug fit, the liner is guided by the inner ring of the top plate. This ring fits inside the liner, and is 2 in. deep to permit the liner to be lifted this amount before contacting the bottom edge of the top plate. The area of the plate outside of the ring is cut out to clear the studs.



Journal-box washing machine. Motor-driven table revolves each box while being cleaned with inner and outer sprays.



Rack for holding EMD journal boxes while welding. Complete rack accommodates eight boxes, four on each side.

Reconditioning Hyatt Roller-Bearing Boxes

In reconditioning Hyatt roller-bearing boxes at one large system railway shop, the first operation after draining the oil is to slide each box off the end of the axle and take it to the journal box washing machine. Here the box is revolved at a speed of 7 r.p.m. while No. 24 Oakite is sprayed at 35-lb. pressure inside and outside. Then, with the box still revolving, a jet of water and steam, then all steam, then air, and last a spray of Oakite special protective oil are shot on the box, the oil going to the inside only. A special device is used to lift journal boxes in and out of the washing machine.

The box is then taken from the washing machine to the welding booth where all liners are checked, worn ones replaced and any loose ones welded down. One illustration shows revolving racks for holding boxes while being welded.

At a well-drained sloping steel work stand or bench, each box is stripped completely and all individual parts washed. Thrust blocks and springs or rubber rings are checked, also spacer rings, any necessary repairs being made. All rollers and the outer sleeve are inspected for defects and any worn or defective parts replaced. The roller bearings are re-assembled and all parts put in place. A new inner race is applied inside the bearings which are tested to see that they turn freely in the box. This is a check against warpage while welding. The cap is applied and set screws wired in place.

The open end of the journal box is covered with a special piece of round sheet metal with four spring clips to hold it in place and keep out dirt until the box is applied.

QUESTIONS AND ANSWERS

Diesel-Electric Locomotives*

COOLING WATER SYSTEM—*Continued*

542-Q.—What provision is made to take care of extremely high temperatures?

A.—A thermal sensitive element is installed in the left bank water outlet manifold between the engine and radiators.

543-Q.—How does the element function?

A.—If the water temperature at this point reaches 185 deg., a high temperature switch located below the fan control, will operate.

544-Q.—What then happens?

A.—A hot engine indicating light will light, an alarm will sound in the cab and the engine in the unit affected will return to idle.

545-Q.—Is there an adjustment to the high temperature switch?

A.—One adjustment can be made, range cut-in temperature only.

546-Q.—How is this adjustment made?

A.—Raised by turning the top adjusting screw down and lowered by backing it out.

547-Q.—Should any attempt be made to adjust the differential temperature?

A.—No. It is factory adjusted and should not be tampered with.

548-Q.—What types of temperature control are in service?

A.—There are two types: Minneapolis-Honeywell and General Electric.

549-Q.—From where is the air for operation of engine water temperature control received?

A.—From the main reservoir through a 70 lb. reducing valve, cut-out valve and filter.

550-Q.—Is this pressure used for the operation of water temperature control?

A.—No, the filtered air is then reduced from 70 lb. to 17 lb. by a reducing valve.

551-Q.—Where does this reduced air then flow?

A.—It passes directly to the engine temperature thermostat.

552-Q.—What is done to protect this low pressure line?

A.—A relief valve, set at 19 psi. is mounted in the low pressure line connecting the reducing valve to the thermostat, as a protective measure.

553-Q.—What is the function of the thermostat?

A.—The thermostat acts as a variable pressure reducing valve, interpreting engine water temperature in terms of air pressure.

554-Q.—To where does the air flow from the thermostat?

A.—The air pressure leaving the thermostat, known as pilot or branch line pressure, is piped directly to two pneumatic electric relays, and two shutter Grad-U-Motors.

* This series of questions and answers relate specifically to the co-G.E. Diesel electric locomotives. The figure numbers and references, by number, to diagrams, etc., relate to the current edition of the Alco-G.E. operating and maintenance manual.

555-Q.—How do the relays function?

A.—To control the fan speed.

556-Q.—How do the Grad-U-Motors function?

A.—To control shutter positioning.

557-Q.—How does the air pressure act in relation to the temperature in the thermostat?

A.—The thermostat is reverse acting. When the temperature rises the pressure in the pilot line falls.

558-Q.—What does each pneumatic relay of pressure switch represent?

A.—Each switch represents a particular fan speed.

559-Q.—What are these settings?

A.—P-1 set at 11 lb. for medium fan speed and P-2 set at two lb. for full fan speed.

560-Q.—How are these switches connected electrically?

A.—Each switch is connected electrically to one of two relays. Relay R-1 is associated with the 11-lb. switch and R-2 with the 2-lb. switch.

561-Q.—What type shutters are used with this system of control?

A.—The shutters are the modulating type, controlling in any position from full close to full open position.

562-Q.—What determines the positions?

A.—The positions are determined by the engine water inlet temperature.

563-Q.—At the point that engine temperature has risen to 145 deg. F, how is the pressure in the pilot line affected?

A.—At this time the pressure in the pilot line drops to 13 psi.

564-Q.—What action then takes place?

A.—When the pilot line pressure drops to 13 psi. the Grad-U Motors start to function, causing the shutters to partially open.

565-Q.—As the engine temperature continues to rise with a corresponding drop in air pressure, what takes place at 11 psi?

A.—At 11 psi. relay R-1, which is associated with the 11 pound switch will energize the Eddy Current Clutch field through a 10 ohm resistance.

566-Q.—What action then takes place?

A.—The fan will start at medium speed.

567-Q.—With the rise in temperature and drop in air pressure how are the shutters affected?

A.—If the temperature continues to rise a further drop in pilot line pressure will take place, causing the shutters to open wider until 3 psi. pilot line pressure is reached, at which time the shutters will be fully open.

568-Q.—What takes place to produce full fan speed?

A.—When the water temperature reaches 155 deg. F. the pilot line pressure will have reached 2 psi. causing the 2-lb. switch to drop out, which in turn brings in the second relay, thus lowering the resistance in the Eddy Current Clutch field resulting in full fan speed.

569-Q.—What is the operation as the water temperature drops?

A.—The series of events will take place in reverse order.

570-Q.—How is the control set up for automatic operation?

A.—For automatic operation the radiator fan control

switch should be in *Automatic* position on the control panel (Fig. 3).

571-Q.—What additional preparation is required?

A.—Both shutter motor drive rod yokes should be connected to the shutter operating links with link locking pins removed and placed in receptacle on the inside of the hinged cover.

572-Q.—What can be done if either the fan or shutters or both are not working?

A.—The equipment can be operated manually.

573-Q.—What must be done to prepare the equipment for manual operation?

A.—First, close the cut-out cocks to both air filters (Fig. 1) and bleed the system by opening the drain valve in the base of each filter.

574-Q.—What additional preparation must be made in order to operate the equipment manually?

A.—Referring to Fig. 4, the shutter linkage must be altered.

575-Q.—How is this change made?

A.—Remove one inch pipe from receptacle and apply to stub end of shutter operating link. Lift up on pipe and remove chained pin. Position shutter operating link with locking pin in one of the three holes provided for full open, mid-position or full closed shutter.

576-Q.—How is the fan speed provided for?

A.—Move the fan speed control switch to "off," "medium" or "full" fan speed so as to maintain 140 to 160 deg. F. engine water temperature.

Maintenance—Reducing Valve, Filter and Relief Valve

577-Q.—What pressure must the reducing valve be set for?

A.—17 psi.

578-Q.—What would be the result of a lower setting than 17 psi?

A.—A lower setting will cause the fan to operate continuously.

579-Q.—What attention should be given the filter?

A.—Blow down weekly, or more often if necessary, by opening the drain valve. Remove strainer assembly and clean monthly.

580-Q.—At what pressure is the relief valve set?

A.—19 psi.

581-Q.—How is the pressure adjusted?

A.—Remove cap, loosen lock nut and turn adjusting screw clockwise to increase pressure and counter clockwise to decrease pressure setting.

582-Q.—How much blow down should there be?

A.—One to two lb.

583-Q.—How is the adjustment made for the blow down?

A.—To adjust for one pound blow down, remove the lock screw from the side of the valve. Insert a small tool through the screw hole to engage the grooved edge of the regulating ring. Turn the ring clockwise to decrease blow-down, and counter clockwise to increase blow-down. When setting is completed replace the screw and test.

Engine Temperature Thermostat—Operation

584-Q.—Referring to Fig. 7, how is the valve unit (11) designed?

A.—The valve unit is so designed that the branch line pressure is regulated by the force exerted by the temperature sensitive element (18).

585-Q.—How is this force utilized?

A.—The force generated by element *18* is transmitted through the lever system to the valve unit diaphragm *10*.

586-Q.—What opposes the force exerted against the diaphragm?

A.—The force exerted by the air pressure in chamber *7*.

587-Q.—Where does this air pressure come from?

A.—Chamber *7* is open to and has the same pressure as the branch line *9*.

588-Q.—In the event that the two forces acting on the diaphragm are equal, what takes place?

A.—When the two forces are equal, the supply port (5) and exhaust (6) are held closed by the action of the valve lever (8) and the spring.

589-Q.—What takes place when the external force on the diaphragm increases?

A.—An increase in the external force exerted by the lever system unbalances the lever (8).

590-Q.—With the lever thus unbalanced, what takes place?

A.—The lever then pivots on the exhaust port ball and opens supply port (5).

591-Q.—With the supply port open what takes place?

A.—Air feeds into the valve chamber (7) and the branch line (9) until the valve lever rebalances, closing the supply port.

592-Q.—What happens if there is a decrease in the external force exerted on the diaphragm?

A.—A decrease in the external force unbalances the valve lever in the opposite direction.

593-Q.—With the valve lever thus unbalanced, what is the action?

A.—The valve lever then pivots on the supply port ball and exhaust port (6) is opened.

594-Q.—Does this action result in a balance in the forces on the valve unit stem?

A.—Yes. Air exhausts from the valve and branch until the forces on the valve stem are again in the balance. Thus air is exhausted only when the branch pressure is being reduced.

595-Q.—What factor determines the external force on the diaphragm?

A.—The external force on the diaphragm is proportional to the difference between the forces exerted on the main lever (3) by the main spring (2) and the auxiliary spring (14).

596-Q.—With the main lever pivoted (4), what determines the force on the valve unit stem?

A.—The force on the valve unit stem is proportional to the force of the auxiliary spring less the opposing force of the main spring.

597-Q.—What determines the forces exerted by the auxiliary and main springs?

A.—The force exerted by the auxiliary spring is fixed at the factory. The force exerted by the main spring however, is determined by the auxiliary lever (1) which in turn is acted on by the element stem (17).

598-Q.—What governs the action of the element stem?

A.—The element stem responds to the extension or compression of the bellows resulting from the expansion or contraction of the liquid in the element.

599-Q.—What causes the expansion or contraction of the liquid?

A.—This is caused by temperature changes.

600-Q.—Give an example of the action when there is an increase in temperature at the thermal element?

A.—The liquid fill expands, compressing the bellows and moving the element stem (17). The stem moves

auxiliary lever (1) pivoted at (15), to compress main spring (2).

601-Q.—What happens when the main spring is compressed?

A.—With the main spring compressed the force exerted on the valve unit stem is decreased.

602-Q.—How does this affect the branch line pressure?

A.—The branch line pressure is decreased in proportion.

603-Q.—What action takes place when there is a decrease in temperature?

A.—The liquid contracts, the bellows expand and the element stem moves away from the auxiliary lever.

604-Q.—What action then follows?

A.—The force exerted by the main spring on the main lever decreases and the branch line pressure increases proportionately.

Schedule 24 RL

Air Brakes

1380-Q.—What is the action if control pipe 16 air in chamber B is reduced?

A.—When control pipe pressure on the face of the piston is reduced, brake cylinder pressure on the back of the piston (chamber A) causes the piston to move downward.

1381-Q.—How does the downward movement of the piston affect the lever 19?

A.—As the lever is fulcrumed at its right end, the left end of the lever now moves downward, allowing exhaust valve *27* to open.

1382-Q.—Is the exhaust fully open with exhaust valve open?

A.—No. Brake cylinder pressure then flows past exhaust valve, balancing the pressure on exhaust piston *29*, permitting it to open easily. Brake cylinder air in chamber *A* then flows to exhaust (EX.).

1383-Q.—What takes place in the event that control pressure is only partially released?

A.—Brake cylinder pressure will continue to flow to the exhaust until the pressure on the back of piston is lower than that on the face at which time the piston moves upward seating the exhaust valve and the exhaust piston.

1384-Q.—What is the position of the relay valve at this time?

A.—The relay valve is now in *Lap* position.

Operation of the F-6-F-8 and F-1 Relay Valves

1385-Q.—What pressure flows to the F-6 relay valve at the time the system is being charged?

A.—Main reservoir pressure.

1386-Q.—Describe the flow of main reservoir air to the relay valve.

A.—Air from the main reservoir pipe flows through choke *15* to the spring chamber back of application piston valve *30* and to the outer face of the piston, the air pressures thus being balanced.

1387-Q.—If the pressures are balanced, what force serves to hold the piston valve and pilot valve seated?

A.—With the air pressures thus balanced, spring force holds them seated.

1388-Q.—How does passage 16 in the relay valve connect to atmosphere?

A.—Through pipe *16* to passage *16* in the control valve which is connected to exhaust *10* with the control valve in release position.

1389-Q.—How are the diaphragm chambers in the relay valve connected to passage 16 and consequently the exhaust?

A.—Diaphragm chambers *A* and *K* are connected through passages *16a, 17a,* and *17* to passage *16.* Chambers *N* and *P* are connected through passages *18a, 19a* and *19,* past supply valve *92* to passages *17* and *16.*

1390-Q.—With the diaphragm chambers thus connected to the exhaust, what takes place?

A.—Release spring *42* in the relay portion holds piston *36* and the diaphragm stack in release position, where lever *43* is moved to release position, opening exhaust piston *25* and its valve *23.*

1391-Q.—With an application of brakes how does air from control pipe 16 flow to diaphragm chambers A and K?

A.—Air from the control pipe flows through strainer *17* and passage *16a* to diaphragm chamber *A*, and through passages *16, 17* and *17a* to diaphragm chamber *K.*

1392-Q.—Does control pipe air also flow to the other two chambers?

A.—Yes. Air also flows through passage *17,* past supply valve *92* to the face of diaphragm *85,* thence through passages *19* and *18* to diaphragm chambers *P* and *N.*

1393-Q.—What takes place when approximately 7-lb. pressure is obtained in chamber C in the inshot valve?

A.—Inshot diaphragm is deflected, compressing spring *88* and moving piston *84* sufficiently to permit spring *94a* to seat the supply valve *92.*

1394-Q.—What results from this operation?

A.—When the supply valve closes, further flow of air to diaphragm *N* and *P* is cut off.

1395-Q.—With the initial 7-lb. inshot pressure obtained in all of the diaphragm chambers, what takes place?

A.—This pressure is directly effective in chamber *P* where it acts on diaphragm *38,* overcomes the resistance of spring *42* and deflects the diaphragm, moving the self lapping portion to application position.

1396-Q.—What further movement takes place?

A.—The exhaust valve and its piston are seated by the lever *43* and the pilot application valve and its piston are opened, permitting main reservoir pressure to flow to the brake cylinders.

1397-Q.—What braking effect does this operation provide for?

A.—This provides a low brake cylinder pressure sufficient to take up brake rigging slack and apply the brake shoes to the wheels.

1398-Q.—Is the 7-lb. inshot pressure in chamber P retained after the inshot supply valve closes?

A.—Yes. In this manner this inshot pressure is maintained directly on diaphragm *38.*

1399-Q.—Where does further build up from control pipe 16 take place?

A.—Further build up can take place only through passages *16a* and *17a* to chambers *K* and *A.*

EDITORIALS

The Spectroscope in Railroad Service

Opinions vary widely concerning the value of spectroscopic analysis of diesel locomotive lubricating oil. A few feel it is just a fancy gadget which might perhaps be used by astronomers for weighing the stars, but not a thing which has any place in the railroad shop. Many feel it can contribute importantly to good locomotive operation and some believe it should be used constantly to insure long life of parts and to anticipate potential engine failures. A few expressions of personal opinion may serve to illustrate.

One railroad used a spectroscope to determine ingredients of lubricating oil put into an engine crankcase before leaving a terminal. The oil was shown to contain nothing which might cause trouble or that would indicate an unsatisfactory condition in the engine. The locomotive hauled a train to another terminal and returned with a second train to the first terminal. A second spectroscopic test of the oil showed that it contained silver. This could have meant bearing trouble, but further investigation showed that lubricating oil had been added at the second terminal, and that that oil contained some silver. The circumstance illustrated the importance of intelligent diagnosis, and led the railroad to conclude that it must control its use of oil more closely if the value of the spectroscope is to be realized.

Some operators say quantitative spectroscopic oil analysis is too slow, that a railroad cannot afford to keep a locomotive standing around while an oil sample is run through the laboratory. In reply, proponents of the spectroscope say that it is not necessary to hold a locomotive, that any necessary information can be transmitted, and that quantitative tests costing five to ten dollars need only be made after qualitative tests indicate that they are required. The qualitative test referred to consists of making three successive shots of a given sample, and noting whether the suspected harmful ingredient disappears in the second or third test. If it does, the quantity of the ingredient is considered to be so small as to be harmless. An operator can make at least 40 such tests in a day.

Some of the more experienced operators of the spectroscope go on to show how its use is not limited to lubricating oil analysis. They show, as examples, how a certain carbon paper containing an injurious ingredient was causing the sickness of a stenographer, how harmful elements were discovered in food and water, and how the work of the railroad chemical laboratory is greatly reduced when it becomes necessary to determine the make-up of a metal or other substance.

One seasoned locomotive shop superintendent, when asked for an opinion, replied, "There is no substitute for good maintenance." He went on to say that certain things must be done and that most of them need not wait on word from the laboratory. Often, too, he said, it is cheaper to do the work than to make a spectroscopic analysis.

A contemporary shop operator offered the opinion that spectroscopic lubricating oil analysis means very little because of the uncertainties involved in sampling the oil. "How," he asked, "can one get a sample containing everything in the oil by taking a thimbleful out of 100 gallons?" He added that the laboratory could serve, but could not run the shop.

Another said, "You can see water in the oil and you can smell fuel oil, and nothing complicated is needed to indicate these two most common troubles with lubricating oil."

In the last analysis, the diehards will concede that the spectroscope can perform valuable functions, and the most ardent proponents, when pressed, will admit that results depend importantly on getting characteristic samples, and on having laboratory technicians with enough diesel operating experience to know just what a certain spectrographic record means.

Are Second-Hand Wheels Worth Storing?

When a pair of wheels are pressed off an axle because of a badly cut journal or some other defect serious enough to condemn the axle to the scrap heap, a decision must be made as to which of three courses should be followed for disposition of the wheels. Should all such OK second-hand wheels be scrapped; should they be stored for use on company-owned equipment only; or should they be placed in storage for general usage on either system or foreign cars?

The latter two courses are tempting because of natural reluctance to throw away usable wheel mileage for which the railroad has paid out hard-earned money. Nevertheless there remains a very real and practical question as to whether the cost and nuisance of saving the wheels can be justified as a general policy.

Before the wheels can be remounted on any but home cars they must be rebored, and thus become limited for reapplication to axles with relatively large wheel seats. A substantial amount of time can be lost finding an axle and a pair of wheels that will match up for proper mounting pressure.

And the problem may not end here. When two wheels are found with the proper bore diameter for mounting,

half the time the tape sizes vary too much, and the search must begin again to find a third wheel that will match up with both the bore and the tape of one of the first two wheels.

Going through the above procedure can be a headache for any wheel shop foreman when the wheels are to be mounted on new axles. Matching up both for fit and bore can be an intolerable waste of time when using a second-hand axle on which the seat has been turned.

With the high cost of labor it would seem therefore that the practice of saving OK second-hand wheels is open to serious question, particularly at a large wheel shop laid out for high production where the operational sequence would be interrupted. Would it not be more economical in the long run either to throw away the used wheels, or to restrict their application to system cars for which service they would not have to be rebored, and for which the problem of matching up both bore and tape size would be comparatively simple?

Private Line Car Repairs

The comment is sometimes heard, perhaps less frequently now than formerly, that some private car owners either maintain no shops or repair tracks of their own, have an insufficient number of these shops, or do not keep them well equipped and fully manned. The result is that they fail to perform a reasonable share of repair work on their cars which accordingly has to be done by someone else. Since all car owners as well as railroads are in the rail transportation business together and hence interested in getting freight-car loads from originating point to destination without delays, it behooves all and sundry to pull together in the most effective joint car maintenance program which can be developed.

Illustrative of what can be done, one car owner reports that refrigerator and tank cars received at his home shop for repairs are given a preliminary inspection; complete historical data recorded; delivery line defects checked and, if not carded, provision made for joint inspection; car classified for light, medium, or heavy repairs; repairs written up on shop record of repair form; cost of material and labor estimated and, if approved by management in view of the age, general condition and need for the car, repairs are authorized; write-up serves as requisition for material; steel men make whatever repairs are necessary to trucks, underframes, couplers and draft gears; all steel items are checked for good workmanship; particular attention is given to truck springs and snubbers for ride control; A.A.R. Rule 66 is strictly adhered to in reconditioning car journals and boxes.

Carpenters are assigned to repair the car exterior and interior, floor racks, end and side wall racks, ceiling, bunkers, roof, hatch covers and safety appliances. Air brake application, repairs and testing are performed in accordance with A.A.R. Rule 60 by qualified air brake repair men. All operations are closely supervised by repair foremen in the progressive stages of repairs.

Afterwards, the car is again inspected to be sure all work is in accordance with A.A.R. regulations and recommended shop practices. The car is painted; set on the forwarding track; given a final check up and routing instructions secured for movement to a customer's plant, for loading.

It is recognized that the procedure just described covers refrigerator cars, only, but it may be reasonably assumed that similar care is taken in repairing and reconditioning private cars of all other types when the car owner is equally determined to do a thorough job and turn out cars which will give many thousands of miles of revenue service without frequent intermediate visits to railroad rip tracks and car repair shops.

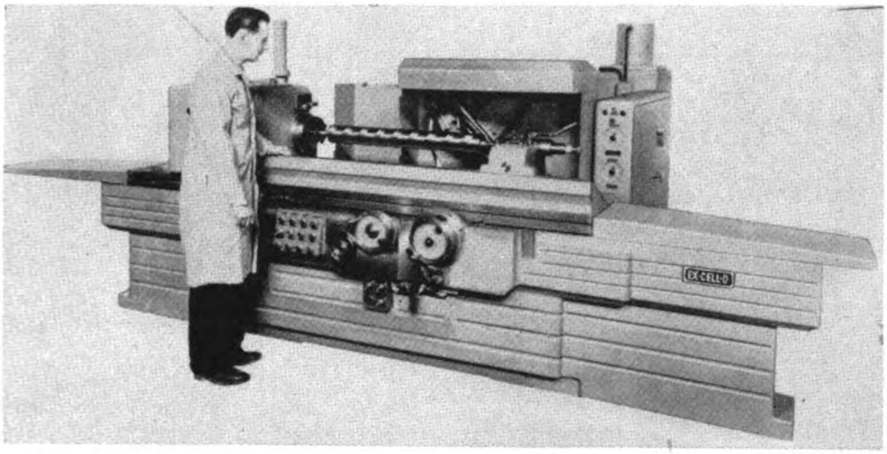
NEW BOOKS

ELEMENTARY HEAT POWER. *Second Edition. By Professors Harry L. Solberg, Orville C. Cromer, and Albert R. Spalding, Purdue University. Published by John Wiley & Sons, New York. 624 pages, 5½ in. by 8½ in., cloth bound. Price, $6.50.*

Elementary Heat Power, prepared as a text to be used in a first course in engineering thermodynamics, or in a terminal course for non-mechanical engineering students, is intended also for those with several years' experience in the various fields of heat power who wish to arrive at a better understanding of the principles behind the equipment they operate. The revisions in this edition keep in mind the original objectives of the book which were to develop an understanding of the functions, principles of construction, and actual performance of heat-power machinery; to provide an adequate and balanced terminal course for students who do not study engineering thermodynamics, and to provide a background for testing heat-power equipment in the laboratory. Fuels and Combustion, Internal-Combustion Engines, Fuel-Burning Equipment, Steam Generation, Steam Turbines, and the Gas-Turbine Power Plant are among the thirteen chapter headings.

ILLUSTRATED PETROLEUM DICTIONARY AND PRODUCTS MANUAL. *Published by Petroleum Educational Institute, 9020 Melrose avenue, Los Angeles 46. 502 pages, 5½ in. by 8½ in. Price, $8.*

This book, prepared on an elementary level, is especially designed for those who do not possess a technical background in petroleum. Its purpose is to provide products information for sellers, buyers, and consumers of petroleum products, and to make available a dictionary of terms commonly used in the petroleum and other industries in connection with petroleum, its products and the equipment utilizing these products. In the preparation of the book local authorities were consulted in an effort to clarify some of the unclassified terms now in general use.

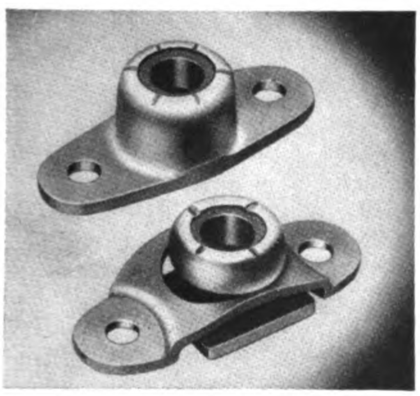


Large Capacity Thread Grinder

A large-capacity machine, the Style 36 Precision Thread Grinder, has been designed for grinding threads, worms and other forms. It is claimed to have the flexibility required for toolroom work, speed production work and maintenance operations. It will grind single or multiple threads, left or right hand, in any pitch from 1 to 28 threads per in. Single- or multiple-rib grinding wheels can be used.

Several types of diamond dressers may be used on the grinder, made by the Ex-Cell-O Corporation, Detroit 32, the choice being determined primarily by the type of thread or form to be ground.

Automatic functions of the device include feed to finish size, wheel dressing, work size compensation for dressing, resumption of grinding cycle after dressing, backlash compensation, control of coolant flow, lubrication, and retracting the wheel at the end of the grinding cycle.



Floating Anchor Nut

Quick self-alignment and simplified assembly of component parts is now possible through the introduction of the model A-41 floating anchor nut, according to its manufacturer, the Elastic Stop Nut Corporation of America, Union, N. J. Weight savings of 1.3 lb. per thousand pieces are claimed over earlier anchor nuts of this type.

Redesign of its old type floating anchor nut permitted the manufacturer to give the new unit smaller over-all dimensions than before. As a result, it is the same size as the firm's standard non-floating anchor nut and complies with all AN 366 (Army-Navy) dimensional and performance requirements.

A special feature of the part is the offset shoulder on the anchor lug which assures full floating action of the nut by preventing interference between it and the two rivets holding the lug to a part or assembly.

The device contains a fiber or nylon locking collar which bolts the nut on the bolt with a positive grip. This principle is utilized to prevent nuts from working loose under all conditions of vibration and impact loading.

◆

Dual-Purpose Preservative Oil

Extensive research has resulted in the development of a dual-purpose lubricant by The Texas Company, Port Neches, Texas. Produced in two grades, Texaco Preservative Oil 10, and 30, functions both as a lubricant and a preservative for the internal combustion engine which is temporarily taken out of service for storage or shipment. It eliminates the need for handling two products successively.

The product combines special additives developed to ensure maximum preservation of internal engine surfaces with motor oil additives of the type used in heavy duty lubricants. These preservative oils incorporate characteristics which in some instances exceed by five-fold the requirements of military specifications.

In addition to its application in "out-of-service" engines, the lubricant-preservative has proved useful in other internal combustion engines in intermittent service. When functioning as a lubricant, it need not be changed until the engine has reached the normal drain-and-refill point. It is compatible with qualified heavy-duty motor oils.

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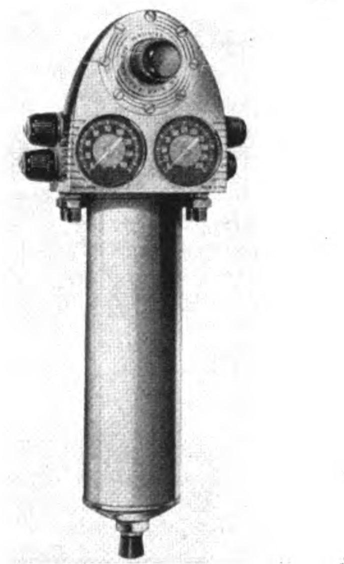


Two-Stage Air Transformer

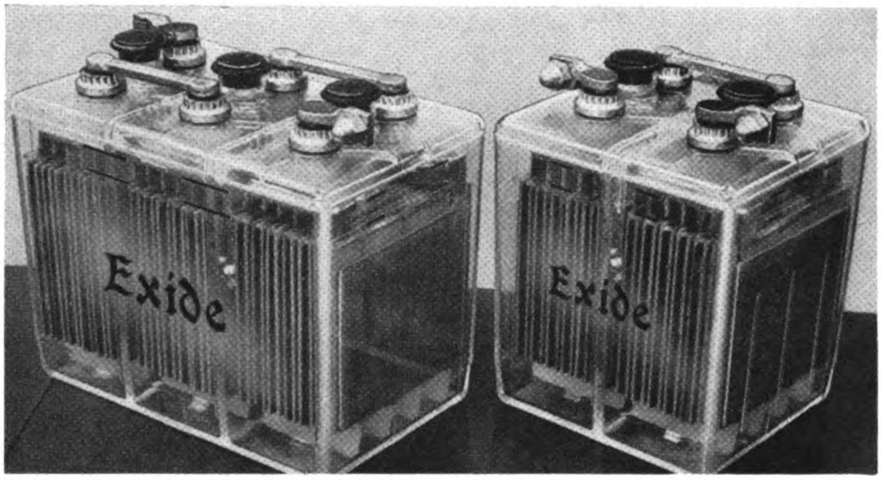
A transformer has been marketed which has a built-in two-stage regulating principle. This provides for easy adjustment of pressures, requiring only finger tip control of the adjusting knob. The knob actuates a small pilot regulator which in turn operates the diaphragm of the large regulator, giving ease of operation.

Oil and moisture, present in all compressed air lines, is eliminated by the model HLD transformer, introduced by the DeVilbiss Company, Toledo, Ohio, which traps the liquids and delivers clean air to the outlets. In tests, 97 per cent of entrained water was removed from 100 cu.

ft. per min. of air at 100 lb. pressure.

The unit has two regulated air outlets and two unregulated. It has a capacity of 100 cu. ft. per min. Oil and moisture captured in the condenser tube is drained by a pull-push drain knob. Pulling the knob down closes the drain, pushing up opens it.

Corrosion resisting metals are used in all parts of the condenser chamber which come directly in contact with compressed air. The head of the transformer housing the regulator, two pressure gauges and valves is a zinc die casting, as is the regulator cap.



Batteries for Stationary Application

A new series of storage batteries of two-cell and three-cell construction for stationary applications offering advantages in space and weight saving, maintenance and improved dependability, have been made available by the Electric Storage Battery Company, Philadelphia, Pa.

Designated as Exide Type PLX, the batteries are in transparent polystyrene plastic cases designed to show the level of the electrolyte, and the approximate state of charge.

Markings on the transparent case indicate the recommended high and low electrolyte levels. Built into each outer cell is a chamber in which a red, a white, and a blue ball float in electrolyte when the battery is fully charged. When the battery is 10 per cent discharged the blue ball sinks. When it is one-third discharged the white ball sinks, and when two-thirds discharged the red ball goes down.

An improved safety factor is achieved by an automatic venting device of clear polystyrene built into each cell to prevent excessive gas accumulation.

Applications for which the new Exide PLX Series is recommended include electric switchgear, communications, emergency lighting and power, laboratories, railway signaling equipment, rural electrification, and alarm systems.

Exide's choice of clear polystyrene is the result of years of experience with this versatile material. The company says that in addition to its proven stability and resistance to acids, it virtually eliminates the breakage which hitherto has been a problem in the transportation and handling of storage batteries in glass jars.

The two-cell PLX batteries have a 50-amp.-hr. capacity at the eight-hour rate, while the three-cell units have a 100-amp.-hr. capacity at the same rate. They may be used in combinations to supply any desired range of voltages.

In construction, the clear plastic cover is firmly cemented to the case. Positive plates are flanked by spun glass Vitrex retainers, against which are placed slotted plastic plate protectors. The latter, in turn, are held apart by microporous rubber separators.

Dimensions of the new batteries range from 4½ in. to 11⅜ in. in length. Width and height have been standardized at 7⁵⁄₁₆ in. x 10⅜ in. in all four available sizes.

Socket Wrench Repair Kit

Two ratchet repair kits for the model B-51 or ⅜-in. square drive and the model S-51 or ½-in. square drive Superratchets have been added to the line of accessories manufactured by J. H. Williams & Co., Buffalo 7, N. Y.

These kits contain a complete assortment of replacement parts and a special spanner wrench. This wrench fits the retaining ring (gland), the only part requiring a tool for assembly or disassembly. Printed instructions are included in each kit.

Light Weight Electric Spray Gun

A trigger action spray gun which is light in weight has been designed by the Champion Implement Corporation, New York 17. This high speed electric pumping device delivers over 90 lb. pressure at 7,200 strokes per min. No compressor is needed.

The heavy duty spray gun can be used for spraying paints, lacquers, enamels, varnishes, chemicals, etc. It is said to be suitable for all types of work including painting, refinishing, touch-up work, cover-up coats or rustproofing.

This gun is a self-contained appliance made of stainless steel with a vibrator motor in the handle. A 25-oz. glass jar and 8 ft. of cord are supplied with every model. It uses a.c. power from a 110 volt circuit.

◆

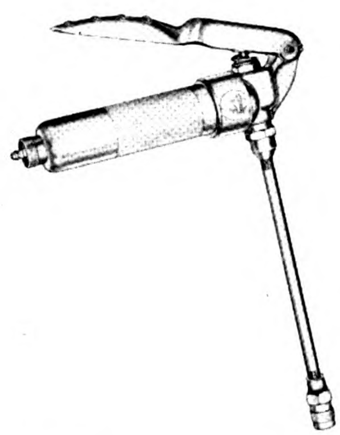
Acid Resisting Plastic Packing

An extruded Teflon plastic packing, designed for packing applications, has been perfected and marketed by the Flexrock Company, Philadelphia 4, Pa. It was perfected for use in centrifugal pumps handling acids, caustics and hard-to-handle solvents, operating at varying speeds from low to 3,500 r.p.m. and higher.

Called Teflon Plastic Packing No. 403, the product is composed of shredded Tef-

lon, blue asbestos, combined with binders and lubricants, extruded into an open cotton yarn jacket which confines it and makes installation easy.

◆



High Pressure Booster Gun

An automatic high pressure booster gun, known as the Model 1120, has been introduced to industry. This unit is designed for the following applications: 1. Lubrication of bearings requiring injection of a small quantity of lubricant at extremely high pressure. 2. An auxiliary high pressure lubricator to service bearings requiring injection of a limited quantity of special purpose lubricants. 3. Cracking clogged bearings on equipment without the use of power-operated gun.

The gun, made available by the Lincoln Engineering Company, St. Louis 20, Mo., provides a complete range of pressures up to 10,000 lb. per sq. in. One-hand operation eliminates fatigue and the unit weighs only 2 lb.

A long hydraulic-coupler extension permits reaching deep-seated and hard-to-reach fittings. The device handles all pressure gun lubricants in any weather and it holds 2½ oz. It can be cleaned by removing only one outlet check and there are no packings to replace.

◆

All-Purpose Pneumatic Tools

A line of standardized tools for ready assembly, featuring a new rotary air motor to provide maximum output at standard air-line pressures have been announced. Introduced by the Independent Pneumatic Tool Company, Aurora, Ill., the line includes lightweight Thor pneumatic screwdrivers, nut setters and grinders.

A total of 85 different sizes, ranging from a 1 lb. 1 oz. grinder to a 2 lb. 11 oz. angle screwdriver are offered. These No. 2 class tools feature interchangeability of housings, handles and attachments.

The drill line has 31 sizes, including angle attachment models in 30, 45 and 90 deg. units along with the straight models. Speeds range from 850 to 14,000 r.p.m. for drilling in aluminum.

The screwdrivers and nut setters number 48 sizes, 28 of them direct angle types in 25 and 90 deg. models. These drivers will handle up to No. 12 wood screws and ¼ in. machine screws or nuts.

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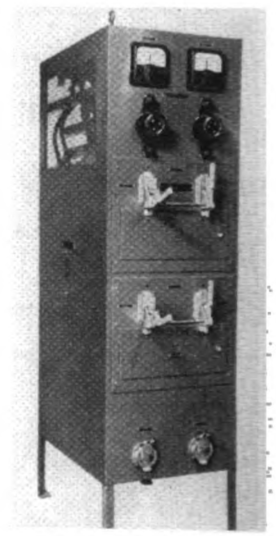
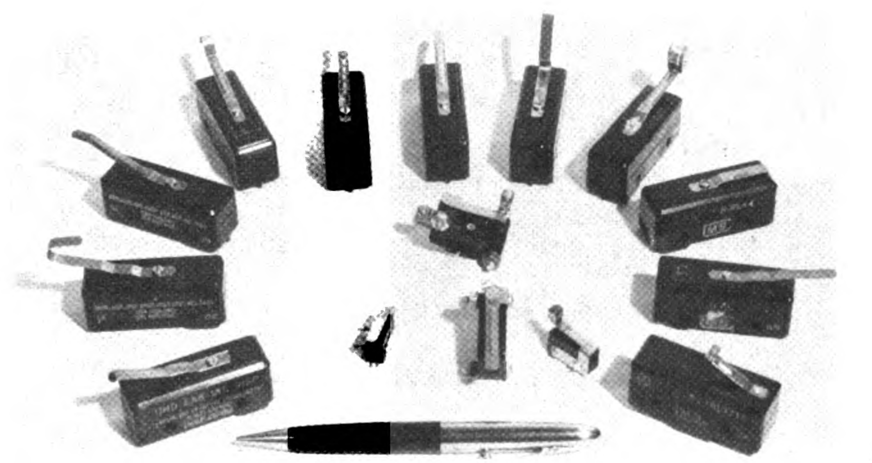


Battery Charging and Discharging Cubicle

A two-circuit battery cubicle has been announced by the Curtis Development & Manufacturing Company, 3266 North 33rd street, Milwaukee, Wisc. Its design is based on the operating experience of a number of midwest railroads.

The new unit, being of the two-circuit type, permits charging on one circuit and discharging on the other simultaneously, and is claimed to have increased the battery shop output approximately 55 per cent where it has been employed. The savings are effected in man-hours through the elimination of attendant's travel time between batteries and controls.

Designed for use on batteries for railway car lighting and air conditioning, diesel-electric locomotives and motive power service, the cubicle is available in two models. Model No. 32 provides for manual control of charge or discharge of 32-volt batteries. The model No. 64-110 cubicle is used for 64-volt batteries, and will also handle one 110-volt lead or Edison battery in split combinations on each circuit. Provisions are made for discharging the split combinations in series, or two 64-volt batteries may be charged or discharged independently.



Precision Miniature Switches

Precision miniature switches are now being manufactured, that will open and close as many as 100 million times. This was made possible by a new type of alloy known as Armco 17-7 PH (precipitation hardening) stainless steel.

Operating clearances in these switches are often critically small, and even a slight change in position of the actuator may render the switch useless.

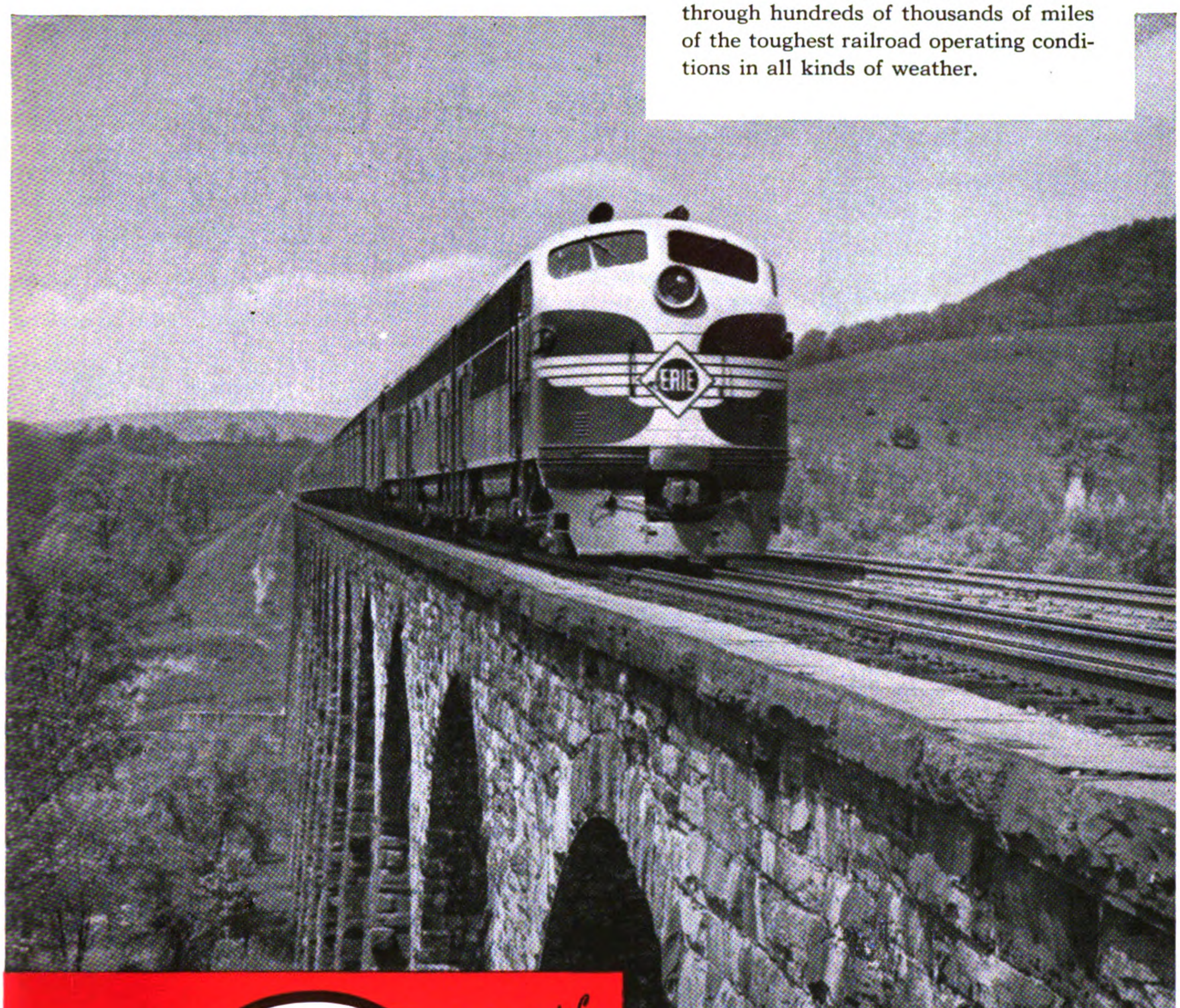
Drift characteristics of 17-7 PH stainless are reported to be superior to any other material tested. Switch life has also been greatly lengthened because of the exceptional flexure endurance of the metal. Another advantage is marked corrosion resistance, which further contributes to long, dependable service.

Some standard types of stainless steels, while durable, have poor spring characteristics when soft enough to form properly. They take a permanent set after relatively few operations. Other standard types of stainless with good spring characteristics will crack when severely worked. 17-7 PH stainless has solved these problems, according to the manufacturer, Micro Switch Division of Minneapolis-Honeywell Regulator Company, Freeport, Ill.

"Tailor-made"

ESSO DIESEL FUEL — is supplying sure, smooth efficient power to Diesel locomotives. Not "just another" good diesel fuel ... Esso Diesel has been specially developed into a dependable, high-quality railroad diesel fuel by years of research and testing.

PROVED ON THE RUN — by actual operation in multiple-unit Diesel locomotives through hundreds of thousands of miles of the toughest railroad operating conditions in all kinds of weather.



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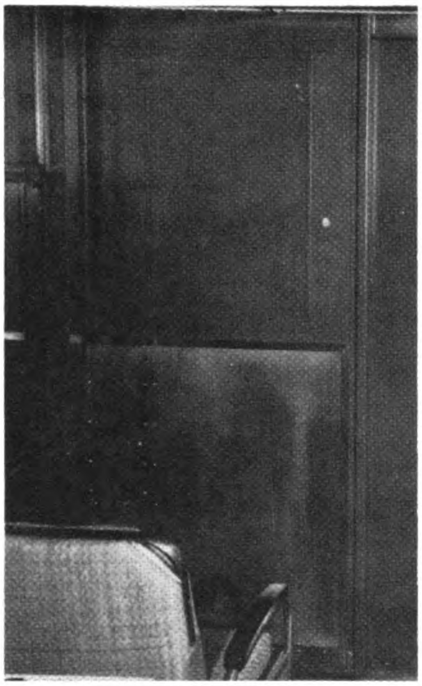


Wall Scuff Plates

Permanent, three dimensional panels of Rigid-Tex metal have been introduced by the Rigidized Metals Corporation, Buffalo 3, N. Y.

When installed, travelers can prop their feet on the walls and relax without the worry of dents, scratches or scuffs. These panels require no maintenance except simple cleaning. No painting or polishing is needed.

The metals have increased flexural rigidity to give added strength resulting in gage reductions. Its surfaces are without glare.

◆

Deep Drawn Steel Cleaning Compound

A compound which is said to completely remove oil, grease and dirt from all ferrous parts has been made available. Developed for use as a precleaner for steel that is to be drawn or extruded, it is a product of the Detrex Corporation, Detroit 32.

Known as Detrex 61, the solution is used at a concentration from 6 to 10 oz. per gal. of water in a soak tank, at approximately 190 deg. F. It has high wetting properties and is free rinsing. It does not contain fatty acids or resin soaps.

◆

Worm Face Gear Grinder Wheels

Popular make gradings and pitches of worm face profiled gear grinding wheels have been marketed by the Jerpbak-Bayless Company, Solon, Ohio. According to the manufacturer, the use of these wheels will cut set-up time to a minimum, save man-hours and critical machine time.

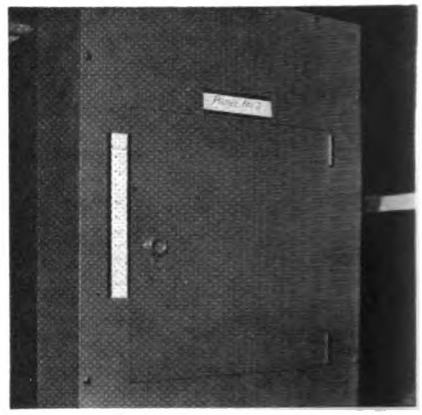
These profiled wheels are formed, with proper root clearances, minimizing root crushing and require a minimum of dressing. The grinding wheel is readily remounted on a machine because the worm face profile is held square and parallel with the bore and face. Each grinding wheel is marked with the proper pitch and form for easy identification.

◆

Write-On-It Tape

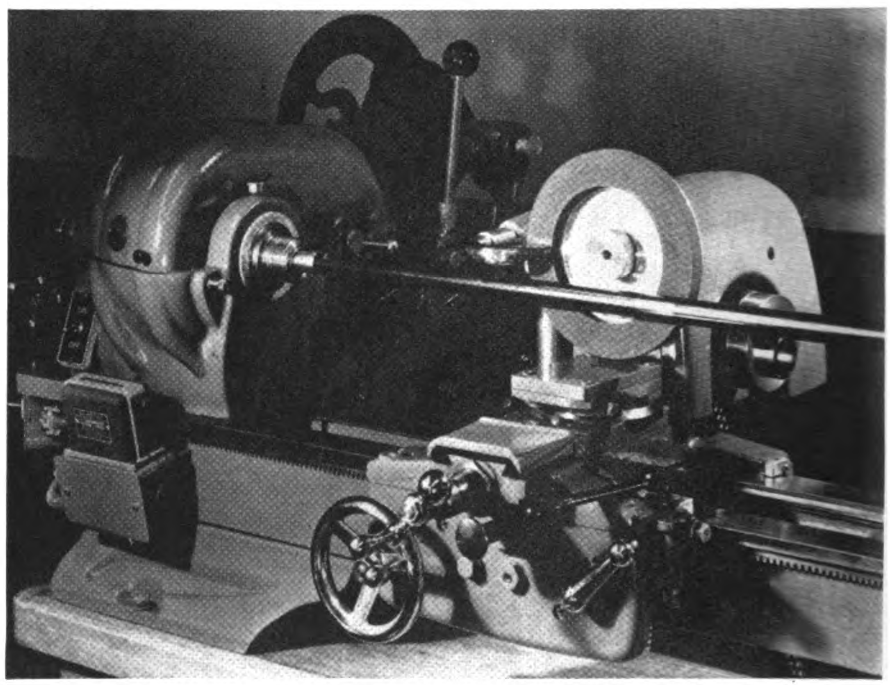
A marking tape is now being made by the Labelon Tape Company, Rochester, N. Y., on which circuit data can be noted and the tape applied directly to panels (as shown in the illustration), to circuit breakers, switches, fuses, wall outlets and as flags to wires and drop cords. The tape is pressure sensitive, sticking without moistening to any dry and comparatively smooth surface.

Labelon tape may be written on with a pencil or any pointed instrument,—but the writing is not on the surface of the tape. It appears beneath a transparent plastic outer layer which protects it against smudging, dust, dirt, oil, water and chemicals



It is not affected by temperatures between —40 deg. F. and 160 deg. F. It can be stripped off one surface and reapplied to another a number of times without leaving a mark or losing its adhesive quality.

Four standard colors, blue, green, black and red, are available, providing an aid to coding in widths from 5/16 in. to 2 in.



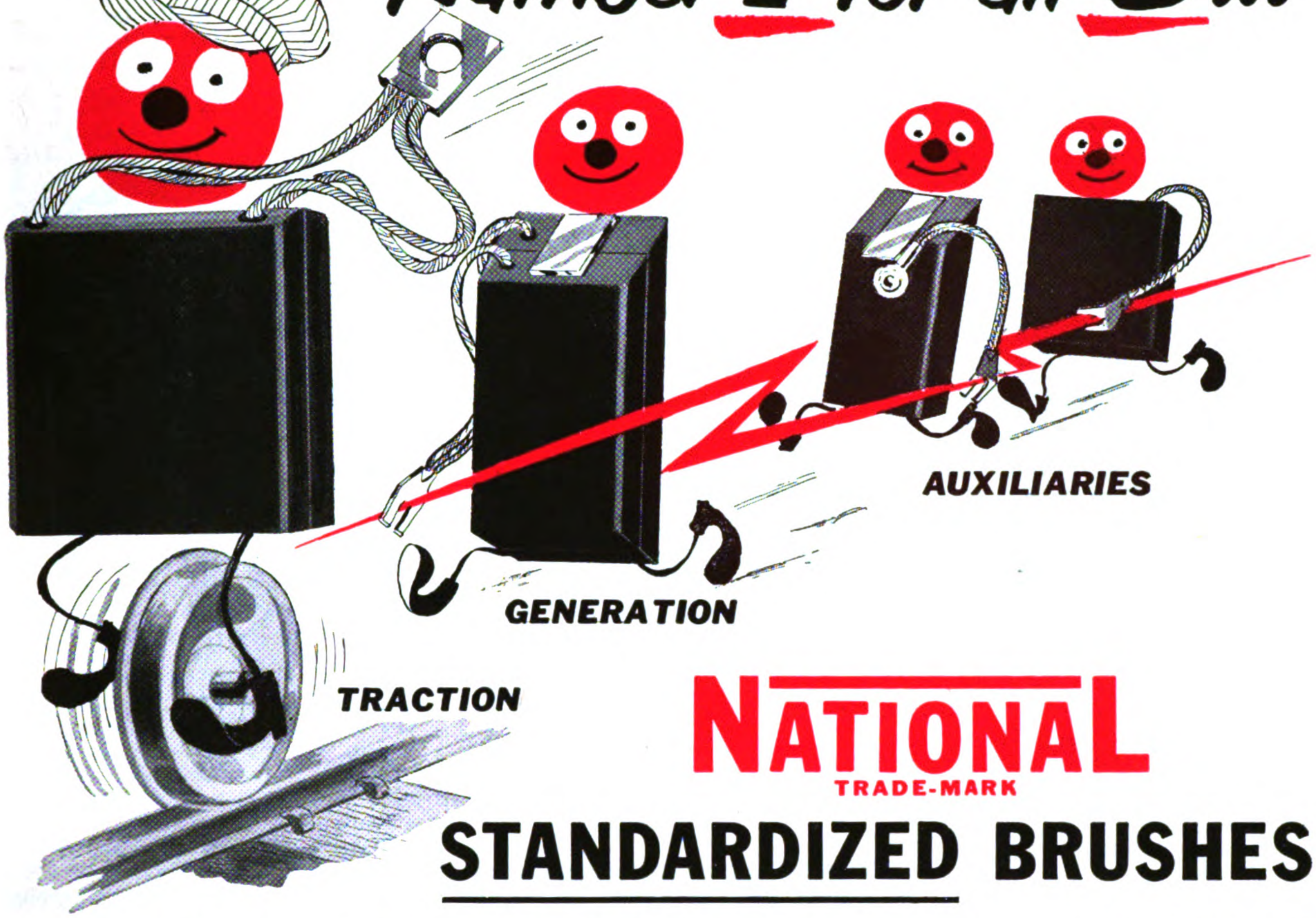
Cylindrical Parts Abrasion Tester

An abrasion tester for rating the wear resistance of protective finishes such as black oxidized or electroplated coatings, plastic and enamel applied to tubing or other cylindrical parts or test pieces has been introduced by the Taber Instrument Corporation, North Tonawanda, N. Y.

Known as the model W-3981, the unit is fully adjustable to take cylindrical specimens from ½ to 6 in. in dia. and 8 to 36 in. in length. The width of the wear track is normally 1 in. However, the face of the abrading medium can be narrowed to wear a track only ½ in. in width, where required.

The abrasion resistance is reported as "the number of wear cycles" the surface will withstand before abrading. These wear cycles are indicated by an electric counter. One wear cycle is one complete revolution of the abradant wheel.

Number 1 for all 3...



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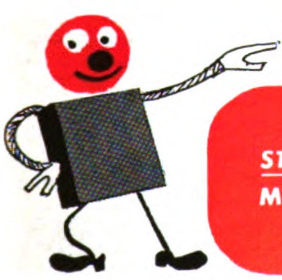
THE REASON: MUCH MORE FOR YOUR BRUSH DOLLAR! HERE'S WHY:

UNIFORM DEPENDABILITY – Every "National" STANDARDIZED brush is one of a carefully controlled production run; you get lot-to-lot freedom from breakage, shunt loosening and other causes of brush failure or excessive commutator wear.

IMMEDIATE AVAILABILITY – Because they're mass produced for stock, all STANDARDIZED brushes are shipped *from* stock; your orders, large or small, go out *when you need them.*

FLAT PRICE – National Carbon's revolutionary STANDARDIZATION program relieves you of the need to order and stock large inventories to get quantity discount; STANDARDIZED brushes carry the same low price tag for 100 or for 100,000 brushes!

DOLLARS AND SENSE...point to "Eveready" No. 1050 Industrial Flashlight Batteries . . . delivering twice as much usable light as any battery we've ever made before. Their unique construction prevents swelling or jamming in the case ...has NO METAL CAN TO LEAK OR CORRODE.

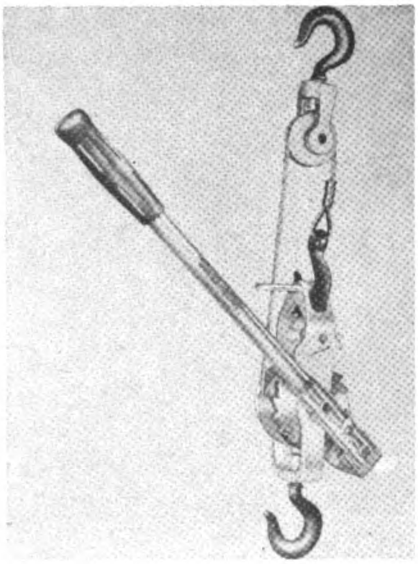


WRITE FOR BULLETIN CP-2426 – "NATIONAL" STANDARDIZED BRUSHES

BUY NATIONAL STANDARDIZED BRUSHES FOR MOST EFFICIENT MOTOR AND GENERATOR OPERATION.

The terms "National", "Eveready", the Three Pyramids device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.
District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco
In Canada: National Carbon Limited, Montreal, Toronto, Winnipeg



Portable Winch-Hoist

A new 1½ ton portable winch-hoist, weighing 8½ lb., has been introduced to meet the requirements of railway shops, and construction work. Named the Lug-All, the unit has a 30 to 1 power ratio and is tested to a 100 per cent overload.

Features of this device, made by The Lug-All Company, Wynnewood, Pa., include preformed flexible aircraft cable, stainless steel fittings and springs, plus oiled bearings. Its handle is reversible and acts as a safety factor to protect the operator.

A combination of three swivel hooks and a built-in pulley block allows work to be performed around corners and as close as 10-in. at the ¾-ton rating. The hoist can be operated in any position and may be set forward, reverse or free-wheeling. Locking is automatic and there is no brake to slip.

◆

Brazing Alloy

A new copper-phosphorous-silver alloy, Phos-Silver, for efficient brazing of copper, brass and bronze is available from the Westinghouse Electric Corporation. Fluidity and good wetting properties enable this new alloy to penetrate tight-fitting joints.

Phos-Silver can be used with any of the common brazing methods for brazing on copper or copper alloys, and is suited for applications where brazing temperatures are critical. Its brazing temperature is 1,225 deg. F. to 1,275 deg. F. No flux is needed in copper-to-copper brazing.

A typical example of torch brazing with Phos-silver is shown in the illustration.

◆

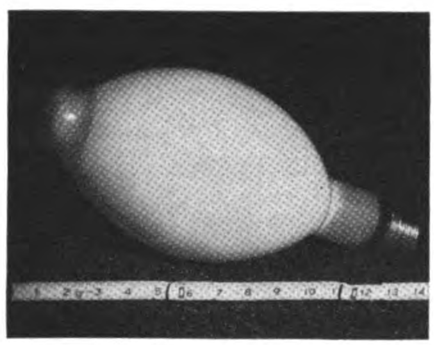
Diamond Lapping Wheel Compound

Cutting tool life can be increased 3 to 6 times and sharp, finish-lapped cutting edges obtained, according to the manufacturer, through the use of a method of wheel lapping developed by Penn Scientific Products Co., Philadelphia 24.

The product called Spectrum Diamond Lapping Compound, is available in any desired grit size and sub-sieve sizes, and is designed for application to lapping wheels. These wheels are interchangeable on all tool grinders.

The wheel lap is packaged in kits and contain the diamond compound, lapping wheel, lapping oil, applicator and wheel charging roller. A variety of wheels and lapping compounds in 12 standard grit sizes may be purchased separately.

◆



A 1,000-Watt Mercury Lamp

The General Electric Company has announced a 1,000-watt mercury lamp for general industrial use where medium- or high-bay lighting is desired. The new lamps will be used in plants which produce heavy equipment, in railroad shops, in foundries, and for street lighting and floodlighting.

Producing 52,000 lumens, or 52 lumens per watt, the lamp is the most efficient of G.E.'s general lighting mercury lamps. It is designed to fill in the gap between the 400- and 3,000-watt lamps in the mercury lamp line. Its life rating is 3,000 hr. at five burning hours per start, and 4,000 hr. at 10 burning hours per start. It operates satisfactorily in any burning position.

Developed in the G.E. Lamp Development Laboratories at Nela Park in Cleveland, the new light source was made to operate on 440-480 volts for highest efficiency. This voltage also makes it possible to operate the lamp with a simple ballast.

Designated the A15, the lamp has an overall length of 14¼ in., and its heat-resistant outer bulb is 3½ in. in diameter.

◆

Electronic Ear

A device called an Electro-Probe which amplifies sounds in machines has been produced by Erwood, Inc., 1770 Berteau street, Chicago 13, Incorporating a pick-up probe and three-stage amplifier, the device becomes an electronic "third ears", super-sensitive to vibrations at the point of contact but unaffected by airborne noises. Speaker and headphones provide audible comparison of vibration sounds within a range of 60 decibels. A calibrated meter provides visual indication.

Designed to be a relative indicating device, the probe helps maintainers to detect and diagnose trouble developing in running motors or machines before failure occurs. Once a reading has been established for an acceptable condition, other tests can be made by means of the meter only.

The Electro-probe is also said to be useful for locating leaks or stoppages in liquid piping systems, locating causes of structural vibrations, etc. It operates on 110-120-volt a.c. power and consumes 36 watts. Dimensions are 10 in. x 6½ in. x 5¾ in., and the shipping weight is 14 lb.

◆

Electrical Tapes

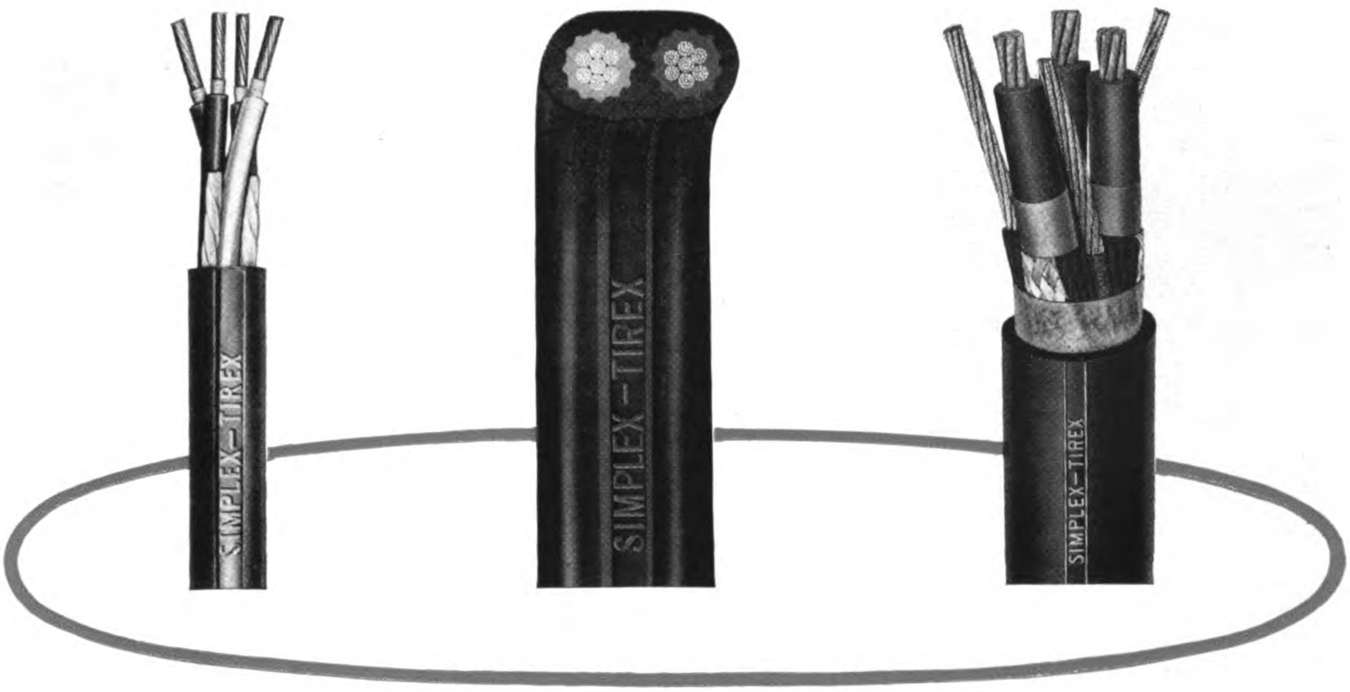
A new line of electrical tapes has been introduced by Ideal Industries, Inc., 1561 Park avenue, Sycamore, Ill. Included are a four-coated, ravel-free friction tape; a quick-fusing, high-dielectric rubber tape; and a two-in-one plastic tape.

The plastic tape provides both insulation and protection against weather and mechanical abuse. The vinyl plastic body is strong mechanically and has a dielectric strength of over 8,000 volts. It is highly resistant to acids, alkalies, corrosive salts, water, oils, greases and alcohols. It is not affected by weather and retains its tackiness well at low temperatures.

The minimum thickness (.007 in.) of the plastic tape, plus its two-way stretch lets it fit snugly to irregular shapes and surfaces. A few layers provide insulation without bulk. Both tape and adhesive are free of corrosive substances.

(New Devices continued on page 150)

TIREX IS A FAMILY



To a great many people the name "TIREX" means a small, flexible, long-wearing portable cord. Actually, TIREX is the name of a family of portable cords and cables. The family ranges in size from a single conductor #18 cord, all the way up to a 3-conductor Type SH-D cable for voltages in excess of 10,000 V.W.P.

TIREX cords are made in sizes from 18 to 10, from single to eight conductors in Type SO, and from two to four conductors in Type SJO. There are TIREX Mine Cords, as well as heavy duty shielded cords.

In the cable field there are single and multi-conductor cables, shielded or unshielded, Types W or G, SH-A, SH-B, SH-C and SH-D.

Your local distributor has many of the TIREX cords and some of the TIREX cables in stock. He can get most of the other stock type TIREX cords and cables for you in a comparatively short time. Be sure to see your local distributor whenever you need portable cords and cables.

SIMPLEX-TIREX IS A PRODUCT OF SIMPLEX RESEARCH

SIMPLEX-TIREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

NEWS

Correction Notice—

Attention has been called to the fact that the statement was made in an article entitled, "Diesel Fueling Alarm Signal" which appeared on page 89 of the June, 1951, issue that: "The whistle in the alarm signal operates at a pressure of 0.5 oz. per sq. in." This is in error. The whistle operating pressure in the alarm signal described in the above mentioned article is 4.0 oz. per sq. in.

CNR Tests New Mechanical Reefer

A NEW type of mechanical refrigerator car, said to be the first of its kind in North America, has been completed by Canadian National shops at Montreal. On running tests, company officers reportedly expect the car's mechanical refrigeration equipment to maintain an interior temperature of minus 10 deg. F., which is considerably below the temperature normally obtained in standard ice refrigerator cars.

A. C. Melanson, chief of motive power and car equipment of the CNR, said the car is the first of its type to be built with refrigeration equipment suspended beneath the car body—an innovation made possible by suspension gear and an air circulating system both designed by engineers of the railroad's car department.

The new car can also be heated when necessary, by transferring power from the cooling equipment to a bank of electric heaters in the ceiling.

N&W To Test Diesel In Freight Service

THE Norfolk & Western is planning to test a diesel locomotive in freight service.

During the fuel shortage created by a miners' strike several years ago, the N&W made extensive tests of diesel locomotives in passenger service, using Southern engines on trains operated jointly with the Southern between Lynchburg and Bristol. "As a result of this test the N&W found no justification for changing from the type of locomotives it regularly used," a spokesman for the road said.

Main line trackage being used in the new tests extends from Bluefield, W. Va., to North Fork, and includes the new Elkhorn tunnel and the just completed Elkhorn grade track relocation west of the tunnel.

The N&W's new coal burning steam electric locomotive is expected to be under actual operating tests in less than a year. This locomotive, being constructed by three manufacturers, will have a water-tube type boiler in which the working steam pressure will be more than twice the steam

(Continued on page 122)

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I. C. C. M-211 AND M-240)

Item No.		Month of April		4 months ended with April	
		1952	1951	1952	1951
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	16,800	26,341	75,492	108,774
3-06	Total, Diesel-electric	26,531	21,784	104,695	82,750
3-07	Total, electric	771	858	3,170	3,274
3-04	Total, locomotive-miles	44,120	48,984	183,393	191,815
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,592	1,754	6,598	6,855
4-06	Empty, total	880	920	3,560	3,369
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	29,751	45,778	135,653	184,545
6-02	Total in oil-burning steam locomotive trains	7,947	13,048	33,262	48,498
6-03	Total in Diesel-electric locomotive trains	73,662	61,472	289,660	230,509
6-04	Total in electric locomotive trains	2,151	2,330	8,797	8,940
6-06	Total in all trains	113,589	122,635	467,547	472,573
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.03	1.04	1.04	1.05
10-02	Loaded freight car-miles	39.40	39.70	39.60	39.20
10-03	Empty freight car-miles	21.80	20.80	21.30	19.20
10-04	Total freight car-miles (excluding caboose)	61.20	60.50	60.90	58.40
10-05	Gross ton-miles (excluding locomotive and tender)	2,815	2,773	2,802	2,700
10-06	Net ton-miles	1,292	1,286	1,300	1,261
12	Net ton-miles per loaded car-mile (M-211)	32.80	32.40	32.90	32.20
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	64.40	65.60	65.00	67.00
14	Averages per train hour (M-211):				
14-01	Train miles	17.70	17.30	17.50	16.80
14-02	Gross ton-miles (excluding locomotive and tender)	49,289	47,397	48,415	44,769
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	44.50	47.70	45.10	45.90
14-02	All	42.30	45.60	43.00	43.80
15	Average net ton-miles per freight car-day (M-240)	893	970	919	947
17	Per cent of home cars of total freight cars on the line (M-240)	44.30	36.50	42.00	35.30

PASSENGER SERVICE (DATA FROM I. C. C. M-213)

Item No.		1952	1951	1952	1951
3	Road motive-power miles (000):				
3-05	Steam	7,015	10,307	30,817	44,537
3-06	Diesel-electric	18,061	15,821	71,724	62,052
3-07	Electric	1,625	1,601	6,598	6,452
3-04	Total	26,700	27,729	109,146	113,040
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	266,811	269,197	1,083,059	1,090,212
4-09	Total in coal-burning steam locomotive trains	37,508	53,800	164,010	235,591
4-10	Total in oil-burning steam locomotive trains	25,017	32,486	103,398	134,358
4-11	Total in Diesel-electric locomotive trains	186,083	165,621	742,025	651,301
12	Total car-miles per train-miles	9.77	9.52	9.74	9.51

YARD SERVICE (DATA FROM I. C. C. M-215)

Item No.		1952	1951	1952	1951
1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	848	1,237	3,720	5,325
1-02	Steam, oil-burning	168	248	683	989
1-03	Diesel-electric[1]	3,113	2,895	12,627	11,451
1-06	Total	4,154	4,404	17,124	17,870
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	29	50	132	211
2-02	Steam, oil-burning	11	13	47	54
2-03	Diesel-electric[1]	254	239	1,022	952
2-06	Total	328	337	1,336	1,351
3	Hours per yard locomotive-day:				
3-01	Steam	7.10	7.80	7.30	8.20
3-02	Diesel-electric	16.60	17.60	16.80	17.70
3-05	Serviceable	14.40	14.40	14.60	14.60
3-06	All locomotives (serviceable, unserviceable and stored)	12.50	12.40	12.60	12.60
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.80	1.73	1.79	1.79
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.76	0.78	0.76	0.77

[1] Excludes B and trailing A units.

on loan basis. Film designed for showing to engineering groups, societies, employee meetings, or others interested in the use of high-property iron castings for component parts. Film illustrates applications in nearly every major industry and is accompanied by descriptive narration.

"MAKE YOUR DIESEL TRACTION REPAIRS STAY REPAIRED"—Westinghouse Electric Corporation, Film Division, Box 2099, Pittsburgh 30. Ten-minute sound film follows a diesel-electric traction motor through a shop typical of the repair shops Westinghouse maintains throughout the country. Standardized repair procedure, dependable workmanship through quality control, speed, and economy are all illustrated as the motor is inspected, repaired and tested. Arrangements for showing the film can be made also through a local Westinghouse representative.

SUPPLY TRADE NOTES

GARLOCK PACKING COMPANY.—*Joe H. Dunlevy* has been appointed district manager of the Los Angeles office of Garlock Packing at 2303 E. Eighth street, succeeding *Clarence W. Harmon*, who has retired because of ill health.

From 1919 to 1929 Mr. Dunlevy was a Garlock sales representative operating from Cleveland, Ohio office. Then for two years he acted as a special representative for the

J. H. Dunlevy

vice president in charges of sales. Since 1930 his headquarters have been at Palmyra, N. Y., where he served as a consultant on mechanical packing problems for the entire company as well as Garlock's special representative contacting the Army and Navy in Washington, D. C. Prior to his Garlock service Mr. Dunlevy was with the Erie and New York Central as enginehouse foreman at various terminal points.

◆

JOSEPH T. RYERSON & SON.—*John W. Queen* has been appointed manager of the Cleveland plant of Joseph T. Ryerson & Son, effective August 15. Mr. Queen has been in Cleveland for the past two months, assisting *William O. Springer*, plant manager since 1945, who has been transferred to the east for special administrative duties while awaiting reassignment in the organization.

◆

BINKS MANUFACTURING COMPANY.—The Cleveland offices and warehouse of the Binks Manufacturing Company have been moved to new and larger quarters at 1241 West ninth street, Cleveland 13. *B. R. Fulton*, district manager, heads the new office. *H. G. Pankratz* is district engineer. Sales representatives in the Cleveland territory are *George Sherwood* (Cleveland), *George Mally* (Indianapolis), and *John Homan* (Cincinnati).

◆

PACIFIC LUMBER COMPANY.—*William G. Van Beckum* has been appointed director of research and development for the Pacific Lumber Company, continuing development in the manufacture of redwood bark fiber for use in lubricating oil filters for diesel locomotives. Since 1948, Mr. Van Beckum has been manager of technical service and assistant sales manager, Special Products Division, Weyerhaeuser Timber Company.

W. G. Van Beckum

Mr. Van Beckum, a graduate of St. Norbert College and the University of Wisconsin, worked under a TAPPI Fellowship for three years at the U. S. Forest Products Laboratory at Madison, Wis. In 1939 he joined the Wood Conversion Company, and in 1942 became chief of the chemistry section of the Weyerhaeuser Development Department, of which he became assistant manager in 1946.

◆

UNION SPRING & MANUFACTURING CO.—*H. C. Bughman, Jr.*, has been elected chairman of the board. *W. F. McCabe* president and *Clarence Abitz*, vice-president of the Union Spring & Manufacturing Co.

◆

APEX RAILWAY PRODUCTS COMPANY.—The Apex Railway Products Company has announced acquisition of a controlling interest in the *M. & J. Diesel Locomotive Filter Corp.*, of Chicago. There will be no change in the present operation of the M. & J. organization; *Jack P. Morris* will continue as president, *R. W. McNeily* as vice-president.

◆

GRAYBAR ELECTRIC COMPANY.— *J. W. Horne* has been appointed manager of the Graybar Electric Company's Norfolk, Va., branch. Mr. Horne, who formerly was manager at Memphis, Tenn., joined Graybar in 1933. *W. J. Bery* succeeds Mr. Horne at Memphis.

◆

UNION CARBIDE & CARBON CORP.—*Arthur C. Bryan* has been appointed vice-president in charge of sales for the *National Carbon Company*, a division of Union Carbide & Carbon Corp.

Mr. Bryan joined National Carbon in 1935 as an industrial salesman in the Chicago office. In 1940 he was appointed a

Arthur C. Bryan

district manager in the New York office, and later moved to Cleveland as assistant manager of the Carbon sales division there. Subsequently he was division manager of the Kansas City sales office. He returned to New York as assistant general sales manager where he became general sales manager in 1949.

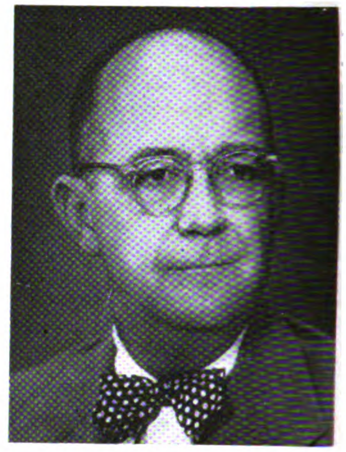
◆

TEMPLETON, KENLY & CO.—*Phillip H. McManus*, formerly general sales manager, has been elected vice-president in charge of sales. Mr. McManus, in addition to directing sales, also will travel in far west-

ern territory. *William H. Zepp* will assist Mr. McManus in Illinois, Indiana, Iowa, Kansas, Michigan, Missouri and Wisconsin.

◆

GUSTIN-BACON MANUFACTURING COMPANY.—*F. H. Ebbert* has been appointed vice-president and general sales manager, in charge of the company's glass-fiber insulation products, industrial, railroad, and automotive sales divisions. Mr. Ebbert was previously vice-president and sales manager of the company's Automotive Division. *George M. Seymour*, has been appointed manager of all railroad sales. Mr. Seymour succeeds *Fred C. Fuller*, who has retired after holding that post for 40 years.



F. H. Ebbert

G. M. Seymour

James G. Holdren has been appointed sales representative of the railroad division of the Gustin-Bacon Manufacturing Company, Kansas City, Mo. Mr. Holdren will maintain headquarters at Richmond, Va., and will cover southeastern states. He formerly was with the Richmond, Fredericksburg & Potomac and the Atlantic Coast Line.

◆

WIX ACCESSORIES CORPORATION.—The Wix Accessories Corporation, Gastonia, N. C., has acquired extensive new facilities adjacent to the company's main plant. The site acquired includes a large modern brick building containing over 70,000 sq. ft. of additional manufacturing and warehousing floor space approximately 150,000 sq. ft. of space is available for future

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For repairs and rewinds of traction motors, auxiliary motors and generators — for maintenance of signal equipment — look into the Irvington line of coated insulations and insulating varnishes.

OUTSTANDING IRVINGTON PRODUCTS INCLUDE:

Class "H" Insulations. Silicone Resin-impregnated Fiberglas*. Silicone Rubber-coated Fiberglas. Silicone Rubber-coated Fiberglas Tubing. Silicone Resin-coated Asbestos. Silicone Resin-saturated Asbestos. Teflon**-coated Fiberglas. Silastic*** Tape.

Class "B" Insulations. Varnished Fiberglas. Varnished Asbestos.

Class "A" Insulations. Varnished Cambric, paper, nylon, Orlon, silk, rayon. Irv-O-Slot slot insulation.

Insulating Varnishes — baking and air drying types. Oilproofing enamels.

Plastic Tubing, Tapes and Wire Markers.

*® Owens-Corning Fiberglas Corp. **® Du Pont ***® Dow-Corning

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VARNISHED PAPER
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additions. Work has already begun on additional headquarters offices and on increased laboratory and engineering facilities.

◆

GENERAL MOTORS CORPORATION.—*John R. Gilmartin* has been appointed general sales manager of the *Hyatt Bearings Division* of General Motors in Harrison, N. J. Mr. Gilmartin succeeds *Howard K. Porter* who has become assistant to general manager on special assignments.

Mr. Gilmartin joined the Hyatt Bearings Division in Detroit upon graduating from the University of Michigan in 1929. He was first associated with the Engineering Department and subsequently became a sales engineer before his transfer to the Hyatt home office in 1941. At Harrison he assumed charge of all Government contracts and priorities and later served as assistant production manager. In 1947 he was appointed assistant to the general sales manager.

J. R. Gilmartin

Mr. Porter joined the Hyatt Bearings Division in 1916 and during the years held various engineering and sales positions at Harrison. In 1926 he became assistant general sales manager and in 1930, general sales manager.

The headquarters of the Southeastern Region of the *Electro-Motive Division* of General Motors have been moved from Washington, D. C., to 118 West Adams street, Jacksonville, Fla., in order to provide closer liaison on not only sales and service activities, but also on activities of the Jacksonville Factory Rebuild Branch between the sales and service personnel and the railroads of the southesast. *R. L. Terrell*, Southeastern Regional Manager, continues in charge.

Major cuts have been made in labor charges on rebuilding principal components of diesel locomotives in the six "factory rebuild" plants of the *Electro-Motive Division* of General Motors. *N. C. Dezendorf*, vice-president of G. M. and general manager of the division, said that all of the firm's diesel locomotive customers have been formally advised that the labor charge upon strip and rewind of traction motor armatures is reduced by 30 per cent and that labor charges upon all other catalogue-listed rebuilding operations are reduced 10 per cent. The traction motor armature-rewind job constitutes the largest single item in the business of the factory branches. The reductions are the direct result of technological advances which have drastically reduced costs, Mr. Dezendorf explained. He pointed out that, since E.M.D. went into the business of rebuilding traction motors, generators, engines and other major components of locomotives for the railroads shortly after the close of World War II, the average hourly wage rates at the factory branches have gone up 59 per cent. "We not only have been able to completely offset this inflationary influence but now are able to announce these drastic reductions," Mr. Dezendorf said. "This is largely due to a program of complete retooling of the factory branches started two years ago and now almost completed. The program has converted these plants from job shops into true production shops where the same high production methods and machinery used in the original manufacturing operations at the main locomotive plants are duplicated."

In the normal operation of diesel locomotives certain of the major components reach a point, ranging from every year and a half to 12 years of their life, in which they need to be completely torn down and rebuilt. The rebuilding operations which it holds itself out to perform for the railroads are not to be confused with the regular repair and maintenance work on diesel locomotives which all carriers continue to do—as they have upon steam locomotives. E.M.D. now operates plants for rebuilding operations at LaGrange, Ill., Baltimore, Jacksonville, Los Angeles, Oakland and St. Louis. Land has been purchased for an additional plant at Salt Lake City.

◆

AMERICAN WHEELABRATOR & EQUIPMENT CO.—*Walter S. Schamel* has been appointed district manager for American Wheelabrator at 3155 Leonis Boulevard, Vernon, Los Angeles 58.

◆

ANSUL CHEMICAL COMPANY.—*Paul R. Larimer* has been appointed general sales manager of the Ansul Company, Marinette, Wisc. Mr. Larimer will be in charge of all four sales divisions—fire extinguisher, refrigeration, industrial chemicals and export. Mr. Larimer formerly supervised the company's government relations program and served as assistant sales manager of the Fire Extinguisher Division. At one time, he was co-owner of Thunderbird Sales Corporation, Phoenix, Ariz., a distributor of Ansul fire extinguisher equipment.

P. R. Larimer

◆

WILLIAM BRAND & CO.—*Ambrose C. Miller* has been appointed product engineer for William Brand & Co., Willimatic, Conn.

◆

JOHNS-MANVILLE CORPORATION.—A major expansion is being made at the Watson, Cal., plant of Johns-Manville. Completion of the new building, enclosing approximately 100,000 sq. ft. of floor space, is expected in the early fall of 1953.

Heywood-Wakefield Company.—*Bryant H. Burns,* who has been appointed to the transportation seating division sales staff of the Heywood-Wakefield Company, with

B. H. Burns

headquarters at New York, succeeding the late *Guy M. Ralph.* Mr. Burns formerly was chief expeditor for the transportation seating division, at Gardner, Mass.

◆

Air Reduction Sales Company.—The railroad department of the *Air Reduction Sales Company,* a division of the Air Reduction Company, has announced appointments of *S. S. Bruce, Jr.,* and *J. S. Stevens* as zone managers, eastern region, with headquarters at Philadelphia and Waycross, Ga., respectively.

◆

Eutectic Welding Alloys Corporation.—A Railroad Welding Advisory Service in the use of Eutectic low-temperature

H. H. Hurley

welding rods has been inaugurated by the Eutectic Welding Alloys Corporation, Flushing, N. Y., The service is headed by *Hugh H. Hurley.*

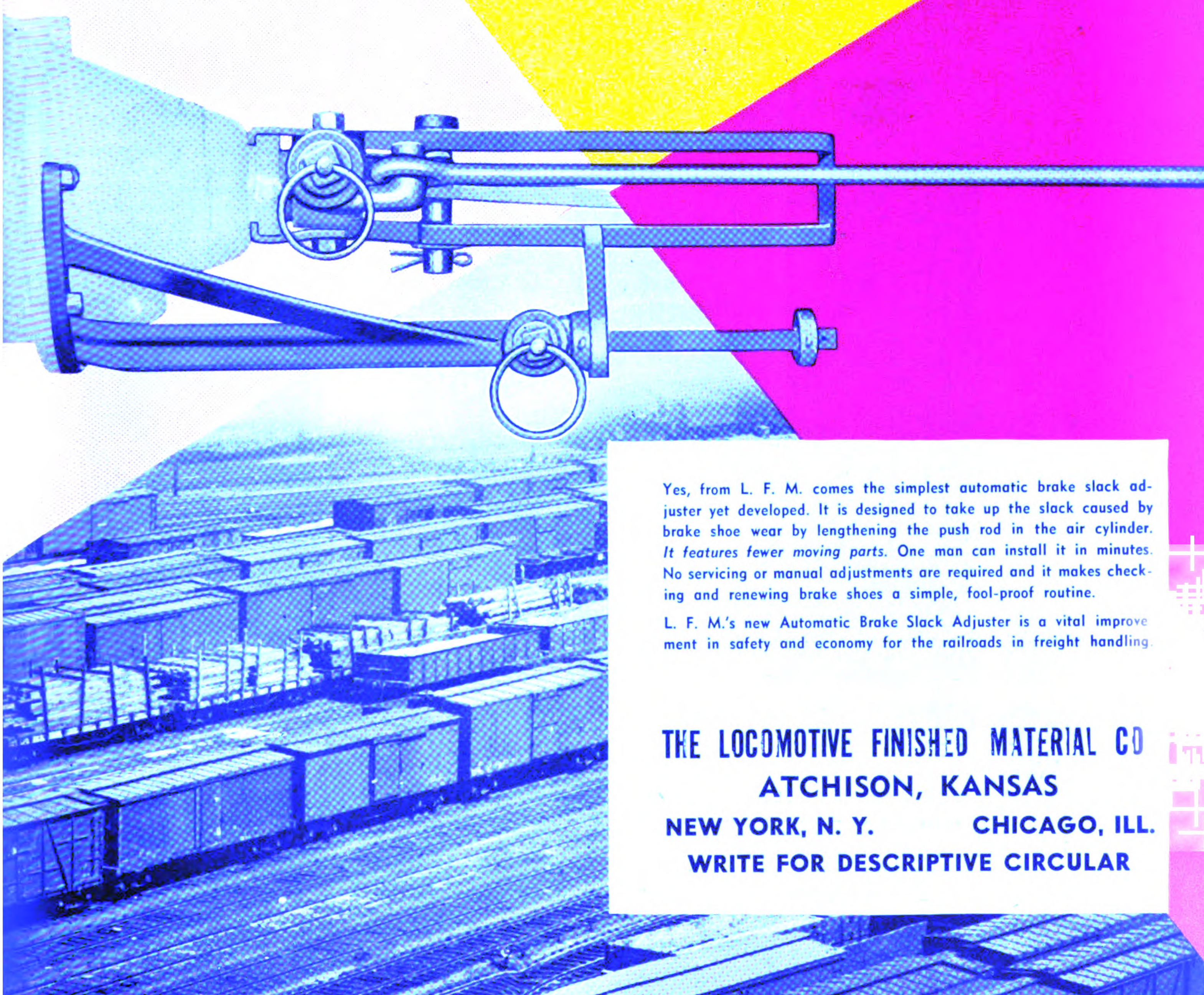
◆

Barco Manufacturing Company. — Work on a new plant and office building at Barrington, Ill.—a Chicago suburb—has been begun by the Barco Manufacturing Company. The new plant, at 500-530 Hough street, will contain approximately 103,000 sq. ft. of floor area. The building is expected to be ready for occupancy

LFM ESTABLISHED 1872

Automatic Brake SLACK ADJUSTER

PAT. APPLIED FOR



Yes, from L. F. M. comes the simplest automatic brake slack adjuster yet developed. It is designed to take up the slack caused by brake shoe wear by lengthening the push rod in the air cylinder. *It features fewer moving parts.* One man can install it in minutes. No servicing or manual adjustments are required and it makes checking and renewing brake shoes a simple, fool-proof routine.

L. F. M.'s new Automatic Brake Slack Adjuster is a vital improvement in safety and economy for the railroads in freight handling.

THE LOCOMOTIVE FINISHED MATERIAL CO

ATCHISON, KANSAS

NEW YORK, N. Y. CHICAGO, ILL.

WRITE FOR DESCRIPTIVE CIRCULAR

around the first of next year, at which time the company will vacate its present facilities in Chicago.

◆

United States Steel Corporation.—*Howard Heiser* and *Earl L. Simanek* have been appointed assistant district sales managers of the *United States Steel Supply Division*, with headquarters at Chicago.

◆

International Railway Car Company.—The *International Railway Car & Equipment Manufacturing Co.*, of Kenton, Ohio, and Buffalo, N. Y., has changed its official firm name to International Railway Car Company.

H. K. Porter Company.—A new stock-carrying branch warehouse and sales office has been established by the *Quaker Rubber Corporation*, division of the H. K. Porter Company, at 2201 N. Washington avenue, Minneapolis, under overall supervision of *T. H. Olson*, Midwest district manager.

◆

Whiting Corporation.—*J. A. Handley* has been elected president and also a director of the Whiting Corporation, Harvey, Ill. Mr. Handley was vice-president and chief executive officer for the past year, and before that was manager of the company's branch plant in California.

American Brake Shoe Company.—*Charles F. Weil*, sales representative at Chicago, retired on August 1 after 47 years in the engineering and sales departments of American Brake Shoe. Mr. Weil, who will continue in railway sales work as a manufacturers' representative, is secretary-treasurer of the Allied Railway Supply Association. *Thomas J. Wood* has been appointed operating assistant to the president of Brake Shoe & Castings Division of American Brake Shoe and *Raymond A. Frick* has been appointed general works manager of the Division.

Mr. Wood joined the Division as assistant metallurgist in 1939. He became superintendent of the Mahwah, N. J., foundry

T. J. Wood

in 1943, and district works manager in 1949. Prior to his new appointment he was cheif metallurgist for the Division. He is a graduate of Lehigh University.

Mr. Frick joined the company as an apprentice in 1942. He was appointed foundry foreman of the Buffalo plant in 1947, and superintendent of the N. Kansas City plant in 1948. Prior to his new ap-

R. A. Frick

pointment he was district works manager. He is graduate of the University of Pennsylvania and served in World War II in the Army Air Corps.

◆

Joseph Dixon Crucible Company.—*Ralph C. Gough* has been appointed special representative in the New England area for the Joseph Dixon Crucible Company.

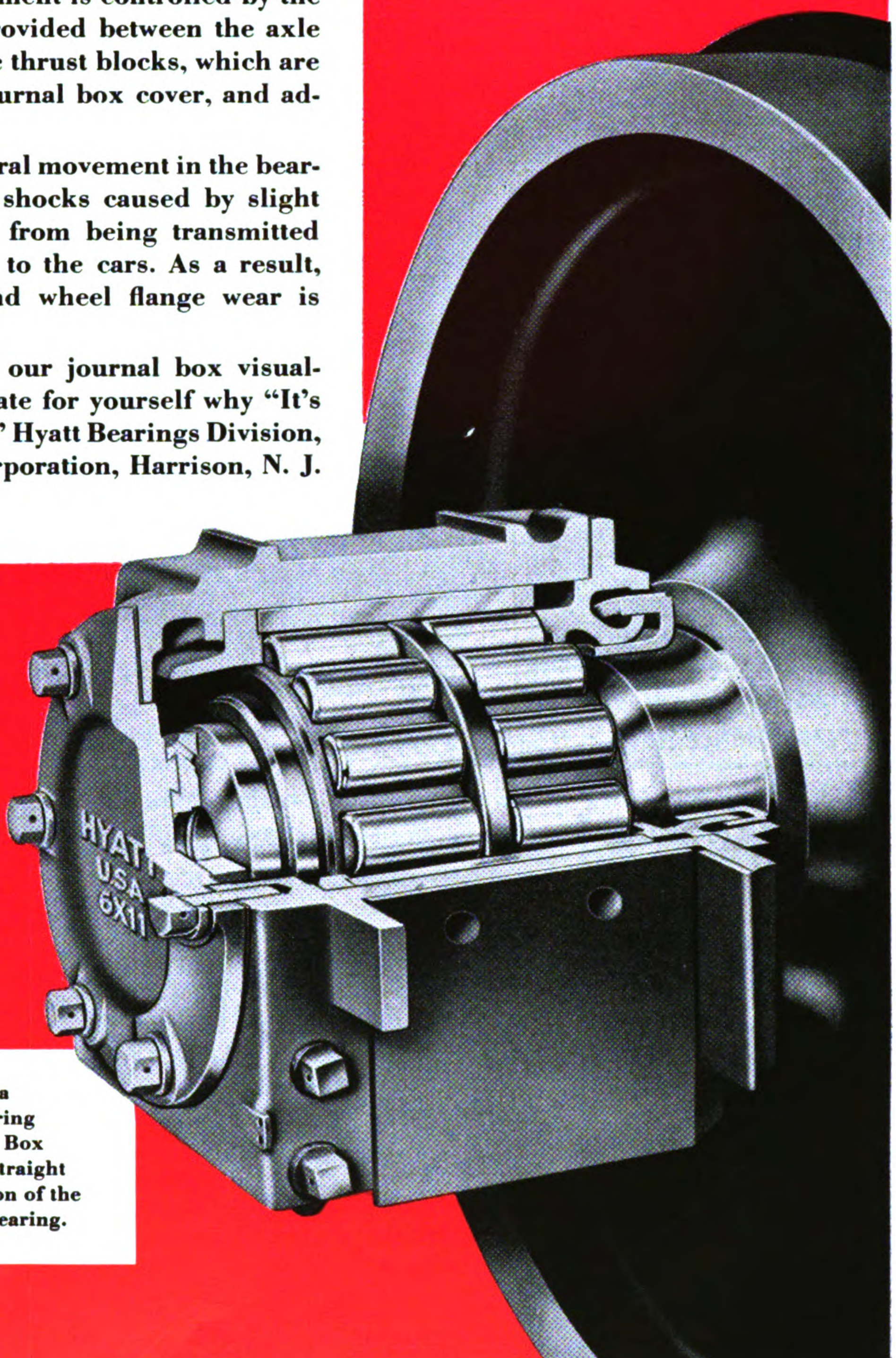
FREE LATERAL for EASY RIDING

Hyatt Railroad Roller Bearings are constructed so that the bearing inner race, which is shrunk on the car journal, can move laterally within the cage and roller assembly.

This lateral movement is controlled by the amount of space provided between the axle ends and the bronze thrust blocks, which are integral with the journal box cover, and adjustable.

Providing for lateral movement in the bearing prevents many shocks caused by slight track irregularities from being transmitted through the trucks to the cars. As a result, cars ride easier and wheel flange wear is reduced.

Write for one of our journal box visualizers and demonstrate for yourself why "It's Easier With Hyatts." Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.



Cut-away view of a Hyatt Roller Bearing Railroad Journal Box showing simple straight radial construction of the Hyatt Railroad Bearing.

HYATT ROLLER BEARING JOURNAL BOXES

Farr Company.—The Farr Company, of Los Angeles, has appointed *Robert S. Bebb*, of Los Angeles, as division sales manager, supervising the Western division. *James E. Matuska*, of Seattle, has been appointed district sales manager for the Northwest district.

General American Transportation Corporation.—*LeRoy Kramer, Jr.*, has been appointed assistant vice-president of the General American-Evans Company division.

Spring Packing Corporation.—*Chauncey Krout* has been appointed to assist the eastern sales manager at Philadelphia, and *Milton Brunner* has been appointed chief engineer at Chicago.

Standard Pressed Steel Company.—*Marshel Moorhouse* has been appointed sales representative, New York City territory. *Walter H. Cunnington* represents the company at St. Louis and handles sales in middle Illinois, Missouri, Kansas and parts of Iowa. *James C. Humphries*, sales representative in Los Angeles, will sell in California, Washington and Oregon. *Francis J. Kinsella*, sales manager in the Detroit territory, has been appointed to the newly created post of regional sales manager in the midwest. His headquarters will continue to be in the Detroit territory offices at 944 Harper avenue. *Daniel F. Hulgrave, Jr.*, who has been with the Standard Pressed Steel sales organization in Detroit since 1949, succeeds Mr. Kinsella as manager of the Detroit territory.

Pressed Steel Car Company.—*C. J. Plisky* has been appointed vice-president in charge of production of the Pressed Steel Car Company. Mr. Plisky was previously vice-president in charge of the firm's Unicel and Jahn Trailer divisions. He joined the company in 1941 as a foreman in the machine shop of the armored tank division at the Hegewisch (Chicago), Ill., plant, and became plant manager in 1947.

C. J. Plisky

Pyrene Manufacturing Company.—*S. C. Williams* has been appointed general field sales manager, and *Walter W. Kemphert*, mid-west district manager, of the Pyrene Manufacturing Company. Mr. Williams, who has worked for Pyrene as sales representative in Louisville, Ky., special assistant to the president at Newark, and district manager at Newark and Chicago, will now be in charge of all field operations and district office personnel. Mr. Kemphert joins Pyrene after holding the positions of mid-west regional manager of the American Pulley Company, vice-president in charge of sales of Skilsaw, Inc., and manager of the merchandising division of the Worthington Pump & Machinery Corp.

United States Steel Corporation.—*William F. Jones* has been appointed manager of sales, Chicago district office, of United States Steel's *National Tube division*, succeeding the late *J. S. Raymond*.

Fairbanks, Morse & Co.—*R. H. Morse, III*, formerly assistant general manager of Fairbanks, Morse & Co., at Chicago, has been appointed general manager of the Beloit (Wisc.) Works, to succeed *Orren S. Leslie*, who has been appointed manager of manufacturing, with headquarters at Chicago.

Mr. Morse, who will now direct all phases of operation at Beloit, began his career with the company at the Beloit plant in 1946. He worked in various capacities, including that of foreman in foundry pro-

duction control, assistant to the manager of engineering and, for the past several years, assistant general manager.

◆

ELLCON COMPANY.—*Thomas B. Wood, Jr.* has joined the Ellcon Company as a sales assistant. Mr. Wood, formerly with

T. B. Wood

the National Pneumatic Company, will be engaged in sales to railroads and transit companies.

◆

WESTINGHOUSE ELECTRIC CORPORATION.—*Donald R. Jenkins* has been appointed manager of the newly formed gas-turbine application engineering section of the steam division of the Westinghouse Electric Corporation, at South Philadelphia, Pa. The section has been formed to handle all company negotiations involving gas turbines for land and marine service. Mr. Jenkins has been an application engineer in the electric utility department of the district office in Salt Lake City since February 1951.

◆

MINNEAPOLIS - HONEYWELL REGULATOR COMPANY.—Minneapolis-Honeywell has expanded the sales organization of its transportation division with the appointment of three new field engineers and the addition of other personnel in a number of major cities. *James Ayers,* formerly with the Electro-Motive Division of General Motors Corporation, has been appointed field engineer in San Francisco; *Anthony J. Orlando,* formerly with the New York Central, field engineer in New York; and *John McSweeney,* field engineer in Cleveland. *Milton Edgren,* formrely with the Pullman Company, and *Allen F. Blanding,* formerly service installation manager of Honeywell's Syracuse, N. Y., branch office, have been appointed application and service engineers in Chicago and New York, respectively. *Donald Plasterer,* formerly with International Business Machines, has been appointed application engineer in Chicago. *W. R. Barnard,* field engineer, has been transferred from Richmond, Va., to Philadelphia; *K. E. Koza,* field engineer, from Chicago to St. Louis; and *T. R.*

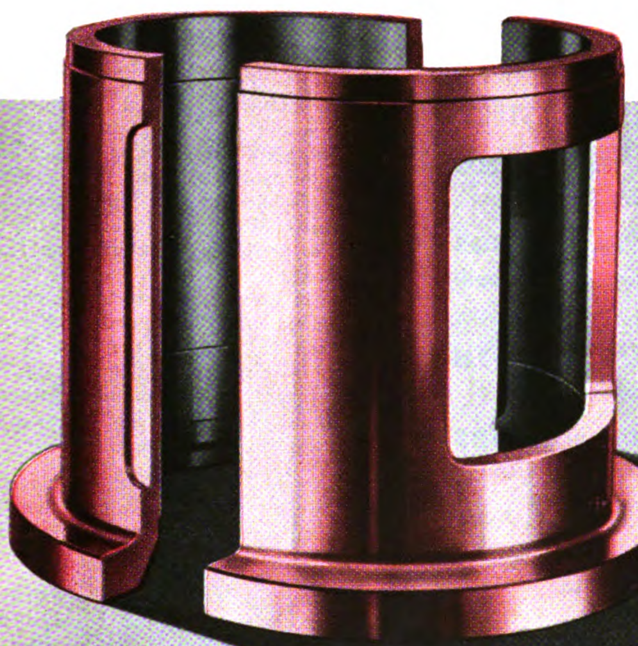
For trouble-free bearing performance between motor overhauls

MAGNUS High Mileage TRACTION MOTOR SUPPORT BEARINGS

Mechanical and operating men know that traction motor support bearings are an important factor in today's trend to *higher mileage* between overhauls. They know, too—from years of experience—that putting cost-saving extra miles into precision bearings is a real art with Magnus.

That's why more and more railroads from coast to coast are equipping their Diesel locomotives with longer-lasting Magnus HIGH MILEAGE Traction Motor Support Bearings—and setting new records for trouble-free bearing performance between motor overhauls.

These fine, precision-built bearings are now available for replacement on *every type and make* of Diesel Electric and Electric Locomotives and "MU" Cars. You'll find a few of their outstanding features listed below.



- **SATCO LINING METAL** — gives greater resistance to wear and load, with stronger bonds and increased hardness at elevated temperatures.
- **INTERCHANGEABLE DOUBLE KEYWAY** — cuts stock requirements, simplifies maintenance. Bearings can be used on either the commutator or pinion end of shaft.
- **IMPROVED FLANGE FILLET PROFILE** — prevents "feathering" of lining metal and makes it impossible for Magnus bearings to "ride" the fillet.
- **PERFECTLY MATED BEARING HALVES** — paralleled ID and OD assured by final micrometer test of each bearing under load.

FOR COMPLETE INFORMATION get your free copy of Bulletin No. 6000. Just write a post card or letter to Magnus Metal Corporation, 111 Broadway, New York 6, N. Y., or 80 East Jackson Blvd., Chicago 4, Ill.

MAGNUS METAL CORPORATION
Subsidiary of **NATIONAL LEAD COMPANY**

Wagner, from the commercial division to transportation engineer at Minneapolis.

◆

Wix Accessories Corporation.—The Wix Accessories Corporation, Gastonia, N. C., has acquired new plant facilities adjacent to its main plant, including a modern brick building containing over 70,000 sq. ft. of additional manufacturing and warehousing space.

◆

Bethlehem Steel Company.—*Rufus E. Dudley*, assistant metallurgical engineer on the staff of the steel division of the Bethlehem Steel Company, has retired.

Obituary

C. N. Thulin, at one time vice-president of the Duff-Norton Manufacturing Company, and more recently representing the Joyce-Cridland Company, died at Marshalltown, Iowa, on July 21.

Louis Charles Huck, 56, president of the Huck Manufacturing Company, Detroit, died recently.

William Luther Lewis, 68, president of the Chicago Pneumatic Tool Company, died on June 28. A native of Wales, Mr. Lewis was brought to this country as a boy. He was elected vice-president, secretary and treasurer of Chicago Pneumatic Tool in 1930 and president in 1946.

Thomas Cruthers, vice-president of the Worthington Corporation since 1936, died on July 27, at his West Orange, N.J., home.

Guy M. Ralph, formerly a member of the transportation seating division sales staff of the Heywood-Wakefield Company at New York, died recently, after a long illness.

Max Schiller, retired vice-president and treasurer of The Superheater Company, now a division of Combustion Engineering—Superheater, Inc., died on Tuesday at his home in New York of coronary thrombosis. Mr. Schiller, who was 65, had served as president of the American Throttle Company.

Born in Vienna, he came to this country as a young man and settled in Yonkers. He began as a clerk in the office of The Locomotive Superheater Company in 1910 and advanced in its financial department.

Surviving are his widow, a son, two daughters and four grandchildren.

Frederick William Alger, 58, assistant vice-president of the Pullman-Standard Car Manufacturing Company, died on August 3, at his home in Chicago.

William G. Pearce, 93, who retired in 1950 as chairman of the board of the American Brake Shoe Company, died on July 15. Mr. Pearce began his career in the office of the auditor of the Northern Pacific, where he advanced to the position of general manager. In 1902 he left that road to become vice-president of the Griffin Wheel Company, Chicago, and in 1910 joined the American Brake Shoe as vice-president. He became president in 1916, chairman of the executive committee in 1939 and, later, chairman of the board.

MOTOR WHEEL *Deep Flange* JOURNAL BOX LIDS

① Hinge-pin supported by ¾" lid bearings. Worn holes and hinge-pin scoring eliminated.

② Stops hold straight hinge-pin in position under spring pressure. NO TOOLS NEEDED TO INSERT OR SECURE HINGE-PIN.

③ Keeper-pin holds assembly during storage. After hinge-pin is inserted, hand pressure permits removal of keeper-pin WITHOUT USE OF TOOLS.

④ Coil spring and roller assembly, held snugly by sheared ears, lets lid open and close easily without wear on journal box lug.

⑤ Oil-tight center construction permits full articulation up, down, left and right to insure a tight fit.

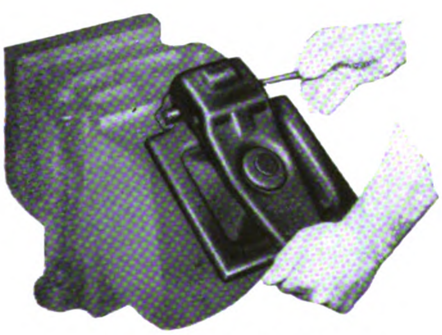
⑥ Full pressed steel construction, 3/16" in housing and 5/32" in cover.

⑦ Opens 120° for easy access to journal.

⑧ Extended housing arm eliminates opening and closing strain on articulating point.

Give You 8 Superior Features plus *Added Protection*

The Deep Flange provides added protection from wind currents carrying foreign matter and moisture so harmful to efficient lubrication. Laboratory and field tests, plus the experience of thousands of lids in use, have proven the merits of the Deep Flange design.



NO TOOLS NEEDED

Neither the standard flange Motor Wheel Journal Box Lid illustrated above nor the Deep Flange model requires the use of tools to attach or detach.

NATIONAL RAILWAY SALES REPRESENTATIVE

T-Z RAILWAY EQUIPMENT CO.

8 S. Michigan Ave. Chicago 3, Ill.

MW

MOTOR WHEEL CORPORATION

LANSING 3, MICHIGAN, U.S.A.

PERSONAL MENTION

Canadian National

E. J. COOKE, superintendent of car shops at Transcona, Man., appointed assistant general superintendent car equipment, central region, with headquarters at Toronto.

Chicago, Milwaukee, St. Paul & Pacific

A. G. HOPPE, engineer of research and development, appointed mechanical engineer. Office of engineer of research and development at Milwaukee abolished.

H. H. MELZER, assistant mechanical engineer, appointed chief engineer of tests, with headquarters at Milwaukee.

D. C. SHEFFIELD appointed engineer of tests (diesel), with headquarters at Milwaukee.

G. H. KOESTER appointed assistant to the superintendent of motive power at Milwaukee.

E. H. HEIDEL, general boiler inspector at Milwaukee shops, has retired.

A. A. EDLUND, assistant boiler inspector at Milwaukee, appointed general boiler inspector at Milwaukee shops.

Elgin, Joliet & Eastern

CHARLES J. TRACY, wood-shop foreman at Joliet, appointed general car foreman at Joliet.

Erie

GORDON E. MCKINNEY appointed chief electrical engineer at Cleveland, as reported in July issue.

Born: 1898, at Ruston, La.

Education: Graduate of Louisiana Polytechnic Institute in 1915.

Career: Became special apprentice in Jersey City shops of Erie in 1916, subsequently becoming electrician foreman at Kent, Ohio; supervising electrician at Youngstown, Ohio, and supervisor of electrical repairs at Hornell and Jersey City. Appointed system electrical engineer in 1943. A picture of Mr. McKinney appeared in the July issue with the announcement of his appointment.

JOHN H. RAY appointed electrical engineer at Cleveland.

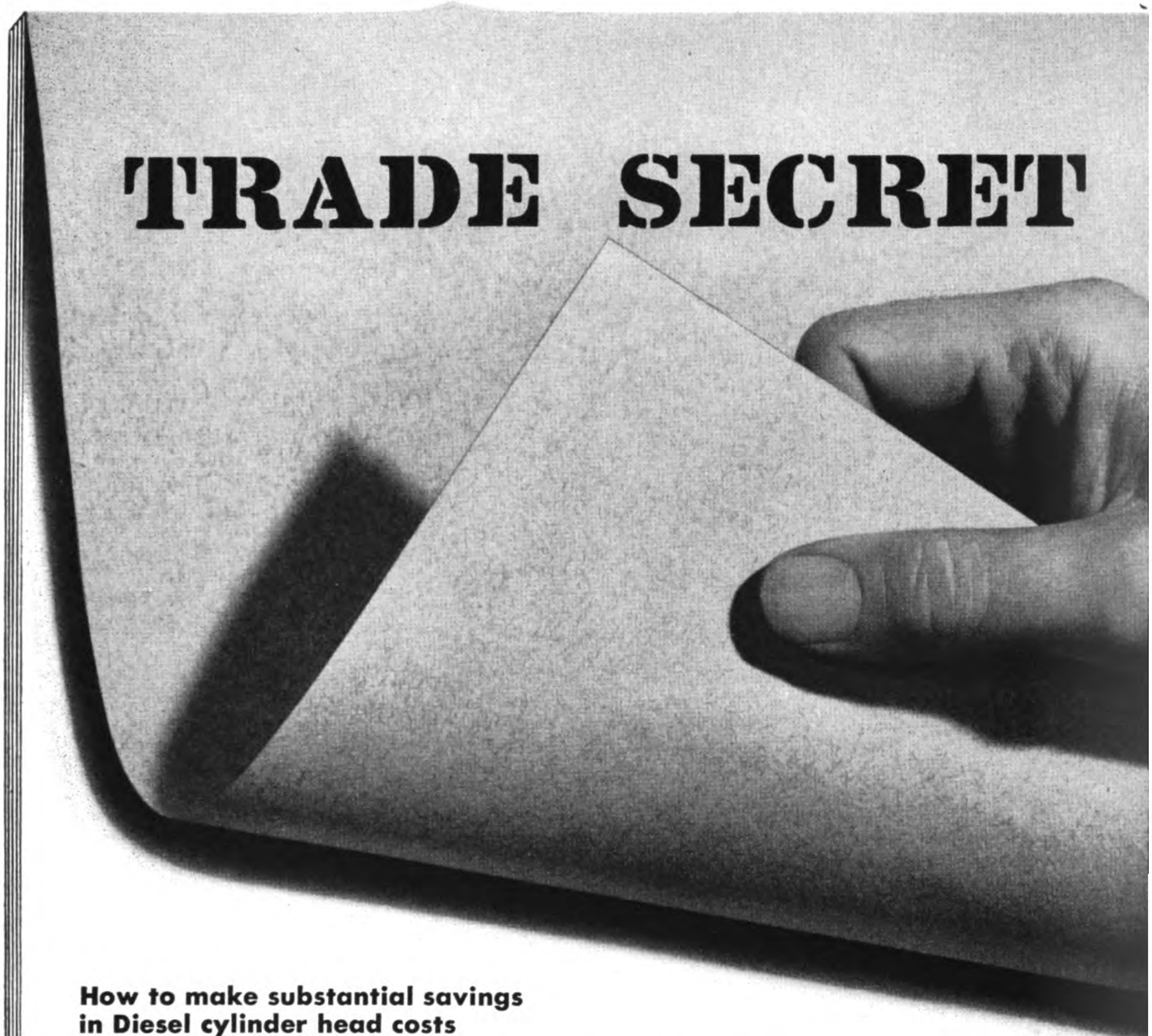
Born: October 16, 1911, at Matamoras, Pa.

Education: Penn State (B.S.E.E. 1933).

Career: Became employed by the Erie as special apprentice (electrical) May 8, 1934; gang leader, May 5, 1938; assistant electrical foreman at Hornell, N. Y., April 17, 1939. Entered the service of the U. S. Army as a first lieutenant, Corps of Engineers, March 29, 1941, advancing to the rank of lieutenant colonel, Corps of

J. H. Ray

Engineers, Army of the United States on May 9, 1944. Now a colonel in the United States Army Engineer Reserve. Returned to the Erie on January 16, 1946, as assistant electrical foreman and acted as special representative for the electrical engineer in the rebuilding of damaged diesel-electric locomotive units. On January 16,


TRADE SECRET

1947, appointed diesel locomotive gang foreman in charge of maintenance and repairs at the diesel shop at Marion, Ohio; on December 1, 1947, appointed diesel shop foreman in charge of installation and operation of maintenance repair facilities at Hornell, and on December 1, 1948, appointed assistant electrical engineer at Cleveland.

Ray Arthur Mylius appointed assisant electrical engineer at Cleveland.

Born: April 16, 1910, at Newark, Ohio.

Education: Ohio University (1928-1930); Carnegie Technological Institute (1930-34—B.S. in E.E.).

Career: 1934-37, Ohio Power Company; 1937-46, Virginian Railway; 1946-48, Ohio Ferro Alloys Corporation; 1948-, Erie.

Missouri-Kansas-Texas

Clay M. Lewis, Jr., chief chemist at Parsons, Kan., appointed engineer of tests at Parsons.

Earl V. Seifert, car and locomotive draftsman, appointed to newly created position of assistant engineer of tests at Parsons, Kan.

New York, New Haven & Hartford

Kenneth Cartwright, general mechanical superintendent appointed consulting engineer, with headquarters as before at New Haven.

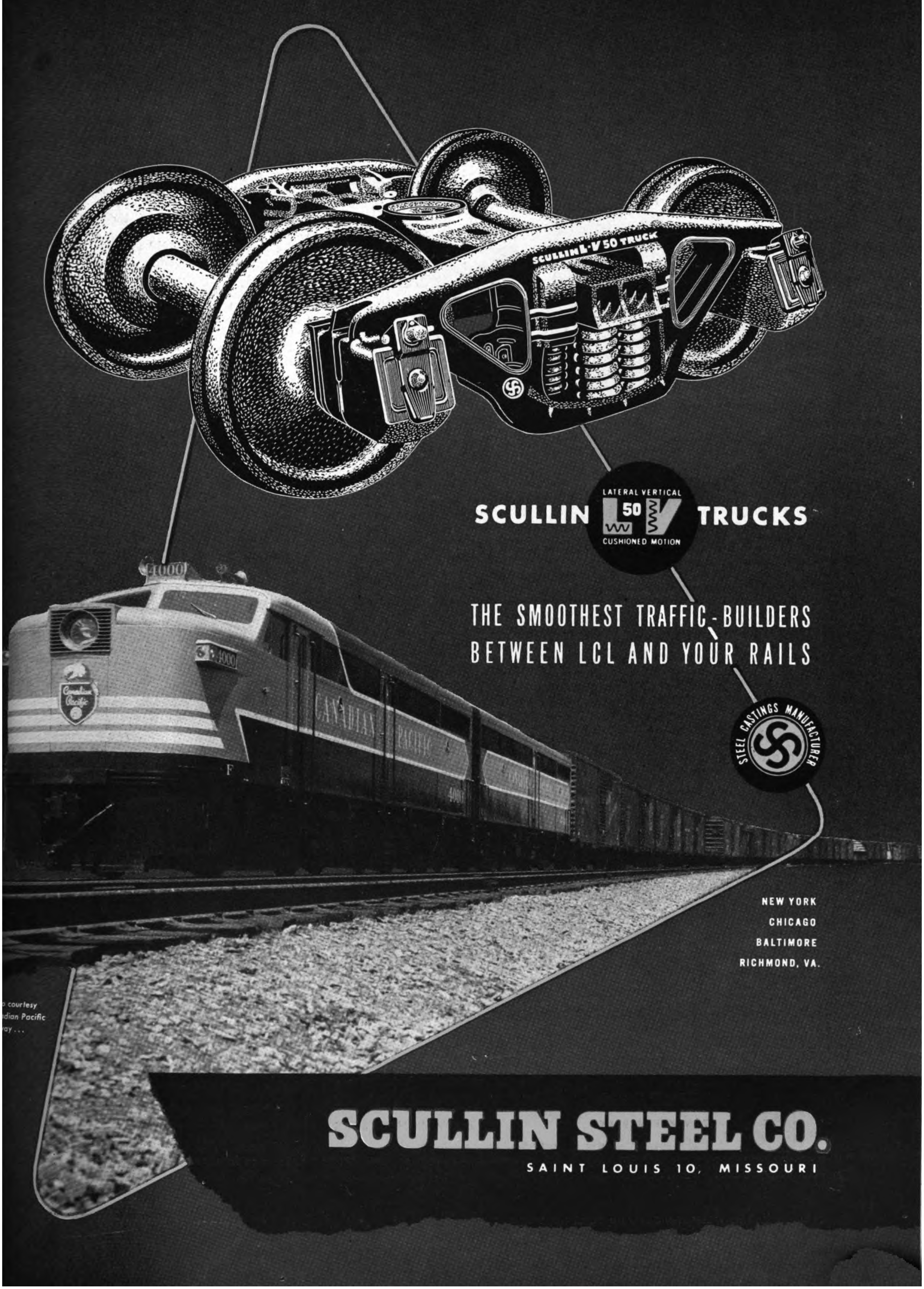
Born at West Epping, N. H.

Education: Graduate of Massachusetts Institute of Technology in 1912.

Career: Joined the New Haven as material inspector in June 1914. After service during World War I as a lieutenant in the Navy, returned to the New Haven in 1920 as assistant to engineer of tests, becoming general mechanical inspector in 1923, assistant mechanical engineer in June 1925, mechanical engineer in September 1935, chief mechanical engineer in April 1944, and general mechanical superintendent in April 1951.

Kenneth Cartwright

W. J. Harlow, assistant general mechanical superintendent at New Haven, appointed general mechanical superintendent at New Haven.


SCULLIN L-V 50 TRUCK
SCULLIN
LATERAL VERTICAL
L 50 V
CUSHIONED MOTION
TRUCKS
THE SMOOTHEST TRAFFIC-BUILDERS
BETWEEN LCL AND YOUR RAILS
STEEL CASTINGS MANUFACTURER
NEW YORK
CHICAGO
BALTIMORE
RICHMOND, VA.
SCULLIN STEEL CO.
SAINT LOUIS 10, MISSOURI

Norfolk & Western

CARL C. STEVENS, car repairer at Portsmouth, Ohio, appointed gang foreman at Columbus, Ohio.

Northern Pacific

H. E. BRAKKE, appointed mechanical engineer at St. Paul, as noted in the August issue.

Education: Graduate of University of Minnesota (1931).

Career: Joined the NP as a special apprentice. During World War II served as an officer in the U. S. Army, returning to the NP in 1946 as draftsman in the mechanical engineer's office at St. Paul. Subsequently became assistant to general car foreman at Brainerd, Minn., and in March 1952 was appointed assistant to mechanical engineer.

Pennsylvania

R. C. JOHNSTON, assistant master mechanic at Pitcairn, Pa., appointed master mechanic at Chicago.

C. C. HANLY appointed master mechanic, Philadelphia division.

T. J. SHERIDAN, master mechanic, Chicago division, appointed acting master mechanic, Susquehanna division.

M. J. MITCHELL, assistant foreman, Ebenezer enginehouse, Northern division, appointed foreman — diesel maintenance, Northern division.

F. P. REYNOLDS, JR., special duty engineman, Fort Wayne division, appointed assistant road foreman of engines, Chicago division.

JAY GOULD, assistant road foreman of engines, Chicago division, appointed assistant road foreman of engines, Southwestern division.

St. Louis-San Francisco

MAX A. HERZOG, chief chemical, appointed engineer of tests at Springfield, Mo. Mr. Herzog will head a new department established to handle the testing of oils and other materials, inspection of water, and similar activities for the entire system.

Southern

SAMUEL R. FLOYD, general foreman car repairs at Charleston, S.C., appointed general foreman car repairs at Alexandria, Va.

PAUL T. HOSKINS, assistant engine-house foreman at Asheville, N.C., appointed general foreman at Asheville.

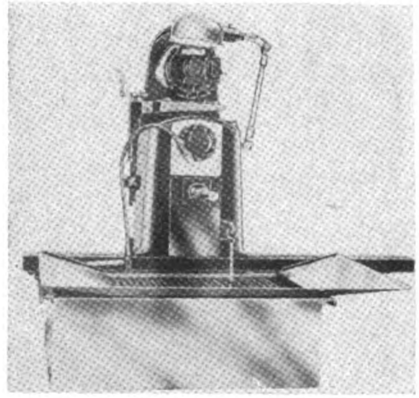
JUDSON V. MCKAUGHAN, assistant enginehouse foreman at Appalachia, Va., appointed general foreman at Appalachia.

ROBERT E. LILES appointed foreman freight car repairs at Jacksonville, Fla.

HOBERT B. KROPFF appointed assistant foreman freight car repairs at Coster shop, Knoxville, Tenn.

New Devices

(*Continued from page 116*)



Bench Model Honing Machine

A bench model honing machine, combining a portable coolant unit has been announced by the Superior Hone Corporation, Elkhart, Ind. Called the model J, it features infinitely variable spindle speeds—400 to 1,000 r.p.m. with no changing of belts; a honing range from 0.185 in. to 2.500 in. in dia. and permanent type mandrels.

The portable coolant device complements the honing unit. Range of adjustment makes it adaptable to any dry honing machine and provides conversion from dry to wet operation.

Overall dimensions of the unit are 25 in. high, 13 in. wide and 16½ in. deep. Its motor is ⅓ hp. and operates from a 110-volt, 60-cycle, 1-phase supply.

◆

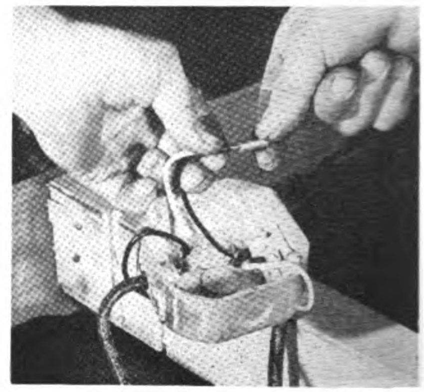
Air-Operated Butterfly Valve

Developed for the control of air, water or steam flow is a contribution of the Industrial division of the Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.—a pneumatically operated butterfly valve.

This device is sized from 1½ in. to 6 in., with screwed connections. Its body, wing and trim material is fabricated in bronze. The unit has a maximum operating temperature of 250 deg F. and maximum pressure is limited to 20 lb. per sq. in.

Described as the Grad-U-Motor, it operates on a controlled air pressure range of zero to 15 lb. per sq. in. Adjustable mechanical stops provided on the motor enable the wing rotation to be limited for special applications. An optional accessory is the Gradutrol relay for positive valve positioning on throttling control installations.

◆



Spring Wire Connector

A new spring-type connector that requires no tools for making pigtail splices in electrical wiring, has been introduced by Minnesota Mining and Manufacturing Co., 900 Fauquier st., St. Paul, Minn.

Designated the Scotchlok brand electrical spring connector, it is said to provide a tight permanent splice for single- or multi-strand wires up to gage 10 in more than 300 different combinations.

Made of zinc-plated steel wire in the form of a tapered coil spring, the lubricated connector is screwed on the stripped ends of the wires with the fingers. A notched turning stem provides adequate leverage during application and is then snapped off leaving a neat splice with no sharp ends.

The coil spring design allows the connectors to expand while being applied, but provides a shake resistant, tension grip

You are sure of SAFE, POSITIVE signals with U. S. Railroad Cables

These Cables have all the United States Rubber Company developments that make for positive safety. "U. S." has been a pioneer in insulation for over 60 years—has accumulated research data and unmatched experience. Electrical insulation is a "U. S." specialty. U. S. Railroad Cables are manufactured to your specifications.

Typical of U. S. Signal Cables for underground use is specification No. 871 embodying the following:

- Solid, annealed coated copper conductor.
- An insulation that is a high heat- and moisture-resistant compound with high insulation resistance and voltage breakdown, as well as low dielectric constant, low transmission loss and low power factor. The thickness of the insulation is .078″ for conductor sizes 14 through 8 and .094″ for conductor size 6.
- A neoprene jacket is bonded to the insulation, providing it with long-time protection against acids, alkalies, heat, light, oil and mechanical abuse, particularly at the exposed ends. The thickness of this jacket is .020″ for conductor sizes 14 through 10, and .030″ for conductor sizes 8 and 6.
- Moisture-resistant, non-wicking rubber fillers are used as required.
- A rubber-filled tape providing cushioning for the outer jacket is applied over the assembly.
- An outer jacket made of neoprene is applied over the taped assembly for additional physical and chemical protection.
- A rubber-filled tape is applied over the outer neoprene jacket to serve as bedding for the bronze tape.
- A bronze tape is applied, providing a tough, non-corrosive barrier against rodents, termites and microorganisms.
- The overall protective covering consists of a jute braid weatherproofed and treated with mica for protection of the bronze tape during the installation and in service.

Write for specific information covering all U. S. Railroad Cables.

PRODUCTS OF U.S. RUBBER SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

Electrical Wire and Cable Department, Rockefeller Center, New York 20, N. Y.

on the wires once the splice has been made.

The small diameter of the connector adds only a fraction of an inch to the diameter of the wires, making it suitable for joining wires in crowded junction boxes.

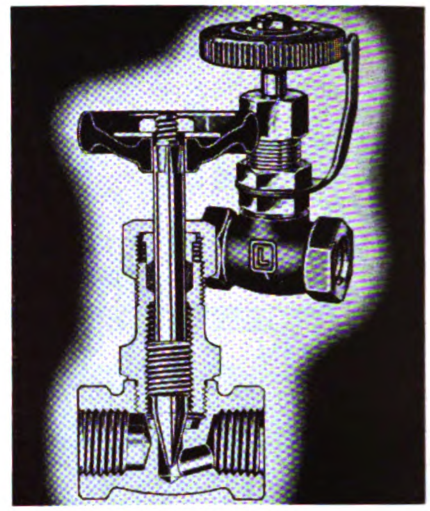
Recommended insulation for use with the connector is plastic Scotch electrical tape No. 33, providing a water- and oil-resistant splice.

◆

Gland Type Needle Valve

A gland type needle valve, made of bronze, has been announced by The Lunkenheimer Co., Cincinnati, Ohio. The device, available in globe and angle patterns, is small and compact and can be used in pin-point control on small lines where fine regulation of flow is essential. It is manufactured in a range of sizes from ⅛ to 1-in.

This control valve is also produced in an indicator model. The indicator globe is available in ¼, ⅜ and ½-in. sizes and the angle is available in ¼ and ⅜-in. sizes. Its handwheel is of cast bronze and has numbered graduations indicated on its face, permitting resetting to a predetermined degree of opening. A spring clip engaging serrations on the outside of the wheel, holds the valve at its proper setting.



With the introduction of these units to the line, Lunkenheimer now produces needle valves in 13 patterns, including a complete line of bar stock steel needle valves in carbon steel, 13 per cent chromium stainless and 18-8-Mo stainless steel.

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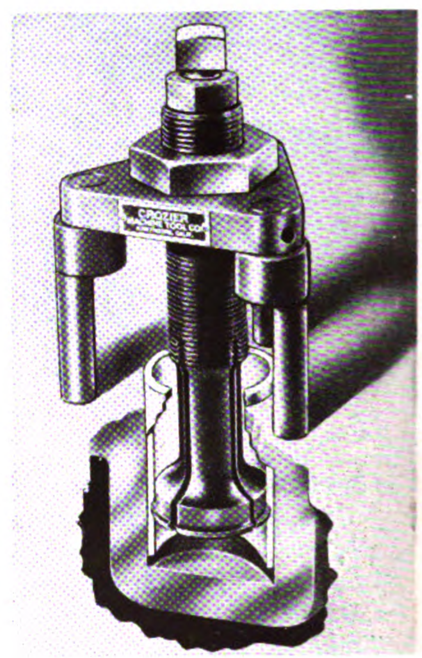


Bushing and Bearing Extractor

Engineered on a new principle, a bushing and bearing extractor for blind holes has been introduced by the Crozier Machine Tool Co., Hawthorne, Calif. This product, according to its manufacturer, saves as much as 75 per cent of the labor time in extracting bushings, bearings, sleeves, liners, roller bearing cups, and races of magnet type bearings and similar objects.

The extractor eliminates the necessity of machining bearings, minimize the hazard of injuring casings or excessive dismantling of equipment. It consists of eight threaded expanding arbors, a draw table with two sets of legs, short and long, adjustable as to distance from the work, and

RAILWAY Mechanical and
Electrical Engineer

Rip track

Hobart Repair Yard Increases Santa Fe's Car Output

Averages 204 cars daily off 16 freight-car repair and cleaning tracks with a total force of 144 men

LAST November the Atchison, Topeka & Santa Fe started using expanded car facilities at Hobart yard which were initiated by the opening of a tank car cleaning plant about a year before. The latest additions consist of the freight car repair and cleaning facilities described in this article. The combined plant consists of a 66-ft. by 361-ft. car-repair shed and associated shop buildings, erected in conjunction with 16 tracks aggregating 15,940 ft. These include five tracks allocated to car repairs, nine tracks to washing and cleaning freight cars, and two tracks especially equipped for cleaning tank-car tanks.

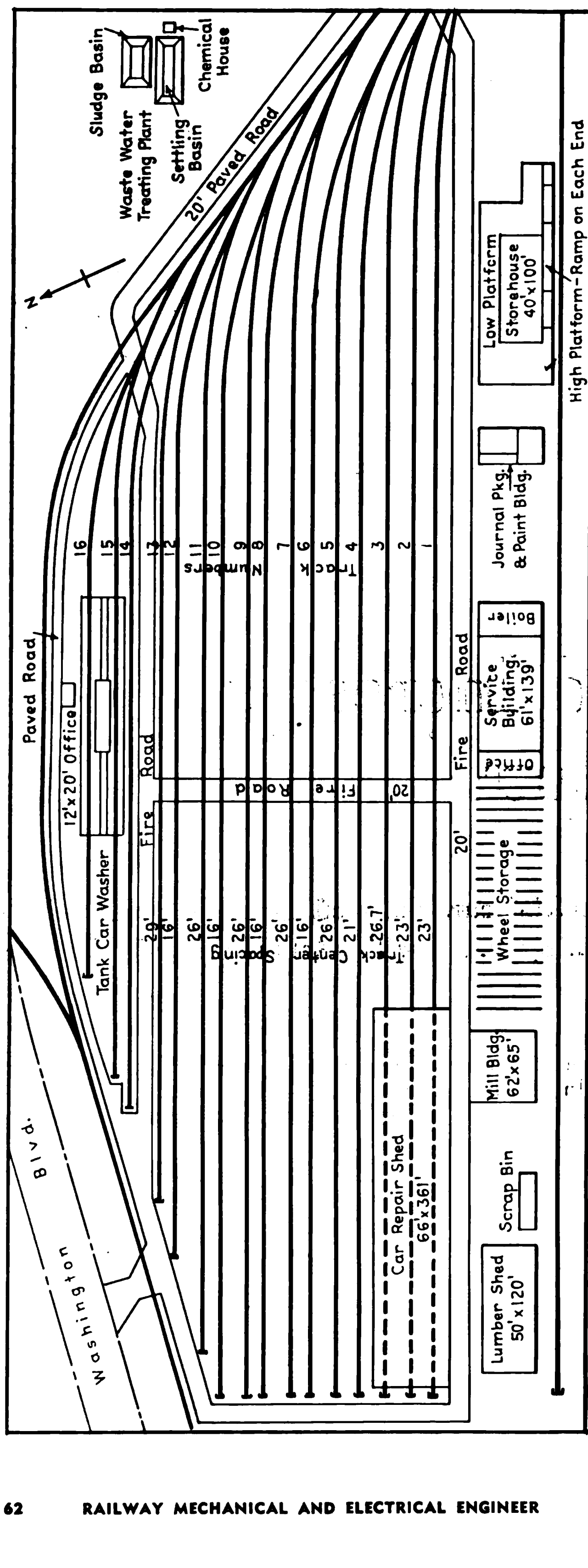
The track capacities of the various units are as follows: 18 cars under the repair shed, 82 cars on outside repair tracks, 164 cars on outside cleaning tracks and 10 cars at the tank-car cleaning station. By way of comparison, this is 58 more cars on repair tracks and 65 more cars on cleaning tracks than could be accommodated at Redondo Junction, 2.3 miles west of Hobart, where the Santa Fe formerly cleaned and repaired freight cars for the Los Angeles area.

Over 4,000 Cars a Month Handled

The output of the present Hobart Yard for the four-month period, February to May, 1952, inclusive, shown in the table, tells an interesting story. The production figures show, for example, an increase in bad-order cars repaired from 705 in February to 855 in May when the daily average was 40 cars. Automobile-rack cars repaired and reworked decreased from 732 in February to about 500 for the balance of the period and averaged 27 cars a day.

The tank-car cleaning tracks and equipment were used

General arrangement of Santa Fe car repair and cleaning tracks, with associated facilities, which are located at Hobart (Los Angeles) Cal.



to clean an average of 122 cars a month, or six cars each working day. Other freight cars cleaned and classified varied somewhat in number during the period, but exceeded 3,000 on two of the months and averaged 135 a day. The grand total of cars repaired, cleaned and classified at Hobart Yard dropped below 4,000 during only one month of this period in which the average output was 204 cars a day reconditioned and turned over to the operating department for further revenue service.

The total repair track force required for this production varied somewhat from month to month, but included on the average about 82 carmen, 2 painters, 3 welders, 5 miscellaneous mechanics, 10 carman helpers, 9 oilers and repackers, 31 laborers and two tractor operators; total, 144. This is exclusive of supervision and office employees, also one helper and two laborers in the small but well-organized and equipped stores department.

General Description of Facilities

The repair track layout extends in a general east-west direction with the car repair shed located at the west end, covering three tracks and holding six cars per track or a total of 18 cars. There is no traveling crane in this shed but it gives overhead protection when necessary for some of the heavier car repair work which must be done at Hobart Yard.

Other shop facilities beginning at the west end include a 60-ft. by 120-ft. lumber shed; a convenient scrap bin; 62-ft. by 65-ft. wood mill car-wheel-storage space having 19 double tracks and a 3-ton, 16-ft. radius full-revolving jib crane; 61-ft. by 170-ft. service building with office in one end and boiler room in the other; small 30-ft. by 60-ft. building to accommodate both the journal packing and paint supply rooms; 40-ft. by 100-ft. storehouse with surrounding low concrete platform, except at the track material delivery side where a high platform is reached by a ramp on either end; gasoline unloading crane and 12,000-gal. underground gasoline tank at the east end.

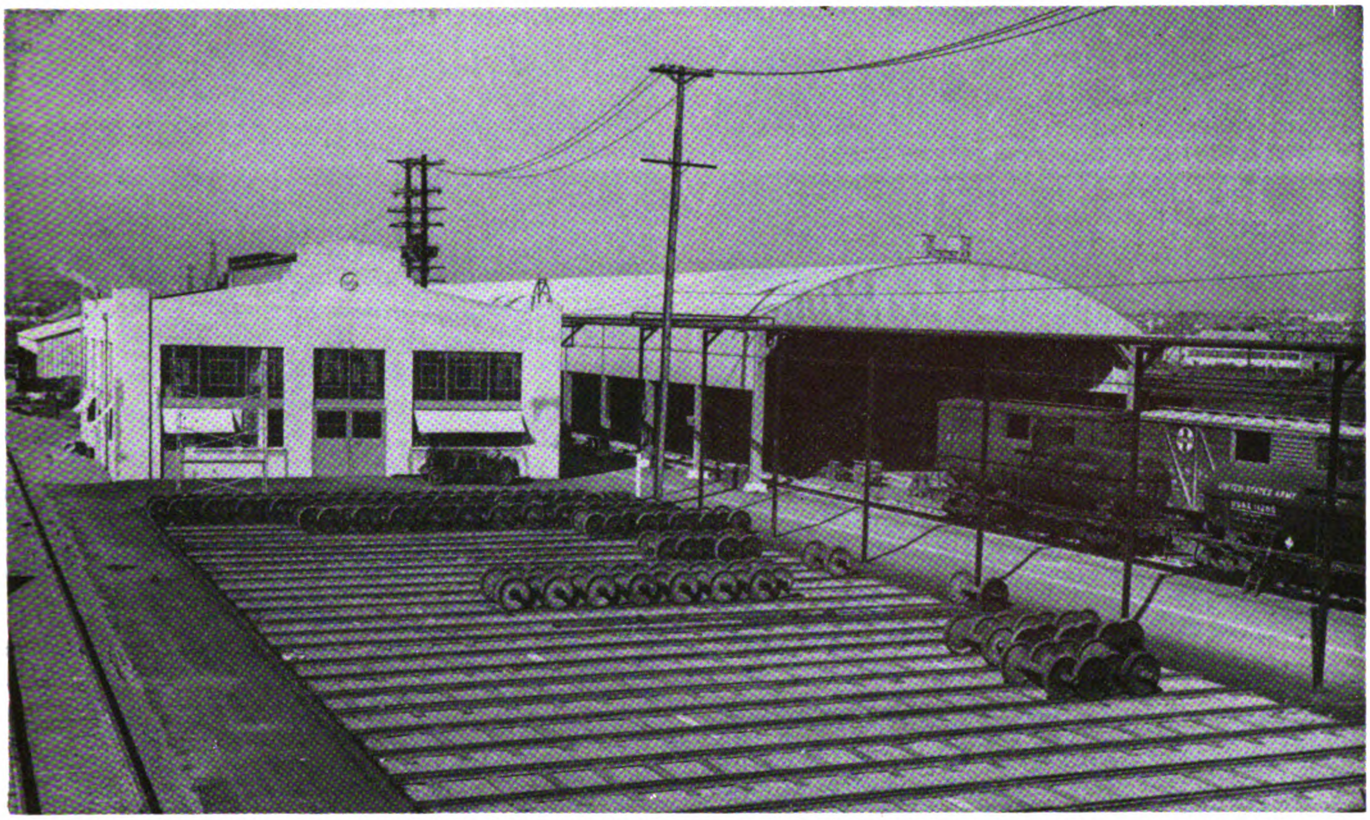
The 16 repair and cleaning tracks are spaced in general on alternate 16-ft. and 26-ft. centers to conserve space and yet provide ample room for movement of trucks, tractors and materials along at least one side of each track. Tracks 1, 2 and 3 have uniform 23-ft. center spacing and there is a 29-ft. space including a fire road between Tracks 13 and 14.

The entire track area is concreted and effectively drained so that it can be kept clean and dry at all times. In fact, an outstanding impression of this yard is its good order, cleanliness and ability to do a thorough job of reconditioning freight cars in minimum time.

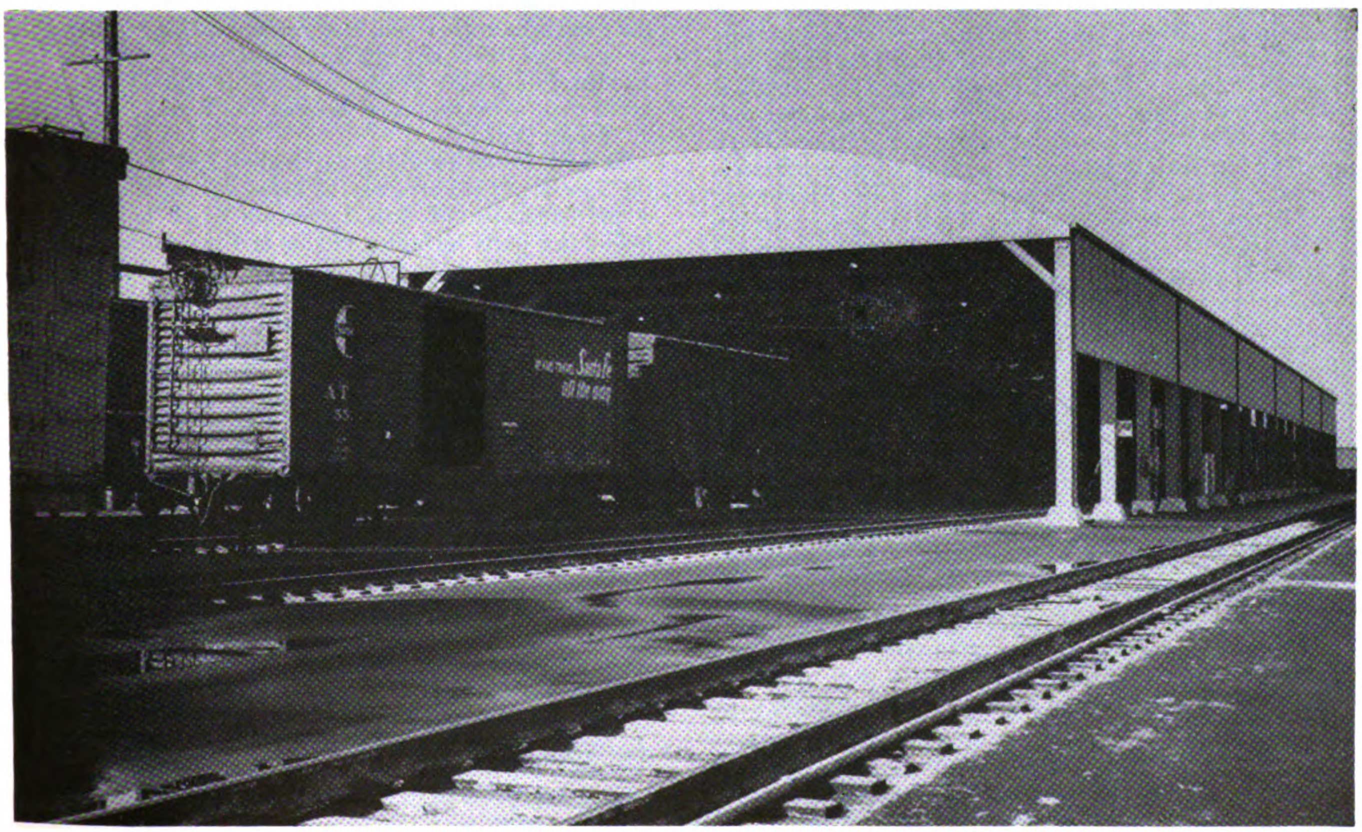
Continuous concrete jacking blocks, 600 ft. in length are provided along each side of Track 1, east of the 20-ft fire road across the yard, and all wheel changes ar therefore made on this section of track. All tracks i the yard except Nos. 15 and 16 are equipped with 2-in. ai lines and suitable outlets at 80-ft. intervals. Even-nur bered tracks have 2-in. water lines, in addition, for ca washing and these outlets also are spaced 80 ft. apart.

Water is carried across the yard in a 6-in. cast iroı underground pipe; air in a new 4-in. overhead air line; and steam to the tank-car washer in a 3-in. overhead steamline. In connection with the tank-car washer, an extensive waste-water treating plant is installed, consisting primarily of a chemical house, settling basin and sludge basin.

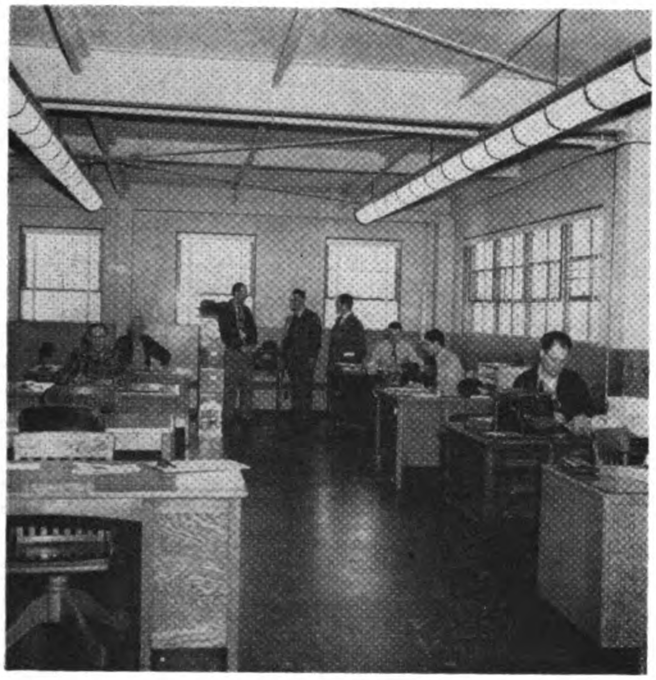
Special equipment in the power house includes two 150-lb. oil-fired steam boilers, three air compressors, one fire pump of 1,000 g.p.m. capacity and two booster pumps, and one water softener. The service building



Mill room and car-repair shed, with wheel storage tracks in the foreground.



The car repair shed will hold six bad-order cars on each of three tracks.



The nerve center of Hobart Yard freight-car reconditioning work.

also houses a small blacksmith shop, air room, machine and welding shops, and a locker room. The blacksmith shop has a 1-ton air hoist, two steam hammers, one air hammer, coke forge and gas forge. The air room is equipped with a metal work bench, tanks for cleaning air brake pistons and all special tools and test equipment needed.

The machine shop has a ½-ton air hoist, one large drill press, one electric-driven pipe and bolt threader, one small drill press, one 14-in. dry grinder with dust collector; a rack and bench to repair Preco fan floor and drive assemblies. The welding shop has four welding booths; one 400-amp. electric arc welding machine; one 1-ton air hoist; one 24-in. dry grinder with dust collector; one receptacle to catch sparks and slag when using acetylene torch to keep slag off the cement floor. The locker room is equipped with 50 wash basins and has space for 200 lockers.

The mill room has one joiner, one planer, one cut-off saw, two rip saws, one wood boring machine, one dry grinder and one wet grinder. The sheetmetal shop is equipped with a power brake, squaring shears, small shears, roller, crimper and various sizes of tinner's stands, small snips, punches and stencils.

The oil house has 22 soaking vats, two oil pumps and ample storage room for new packing. The other part of this building is occupied by the paint shop equipped with various sizes of spray guns and convenient means for distributing paints as needed.

The paint shop, air room, machine shop and office are equipped with fluorescent lights. The blacksmith shop, welding shop, air room, machine shop and locker rooms have overhead heating systems controlled with electric thermostats. Electric drinking fountains are located at convenient places about the yards and shop buildings.

Portable Equipment Featured

Every effort is made to reduce manual labor, especially in handling materials. Portable equipment located at Hobart Yard, includes one International three-ton truck equipped with jacks, blocks, air winch, chain block, acetylene torch and all material and tools needed to repair cars set out on the line. There is also one Dodge 1½-ton truck equipped with small crane, chain block, tools and equipment needed to repair cars at industries.

Other equipment designed more specifically for use in Hobart car repair work, includes a Krane Car with 18-ft. boom for unloading heavy materials such as car wheels; one portable 300-amp. electric welder; one portable 400-amp. electric welder; one P. & H. self-propelled gasoline-driven 400-amp. electric welder; two shop tractors; one lift truck used primarily for moving wheels to and from cars; two Buda chore boys; six A-frames equipped with chain hoists and used in changing car wheels; one gasoline-operated device for testing Preco fans on refrigerator cars.

How the Yard Is Operated

In general, Tracks 1, 2 and 3 are used for repairing bad-order cars at Hobart Yard, Tracks 4 and 5 for reworking auto-rack cars and Tracks 7 to 14 for cars which require only cleaning and classification. In the latter category, refrigerator cars are handled mostly on Tracks 11, 12 and 13 and covered hoppers on Track 14. Tank cars which are OK mechanically but need to be cleaned for other liquid commodity loading go through the tank washing plant on Tracks 15 and 16.

There is little new about the kind of repair work done to cars on the first three tracks, or the way it is handled, except that tools, power jacks, horses and all materials are easily available for the prompt repair or replacement of car wheels, truck parts, couplers, draft gears, air brake and car body parts. Bad-order empty cars are set on these tracks, usually during the third shift, and pulled once a day when repair work is completed. Any cars requiring repairs which seem likely to take more than one day are switched to the stub-ends of tracks under the shed where they will not prevent pulling other cars as soon as they are repaired and ready for service. Loaded cars which develop defects or shifted loads are taken care of in the usual manner on Tracks 1, 2 and 3 at Hobart Yard.

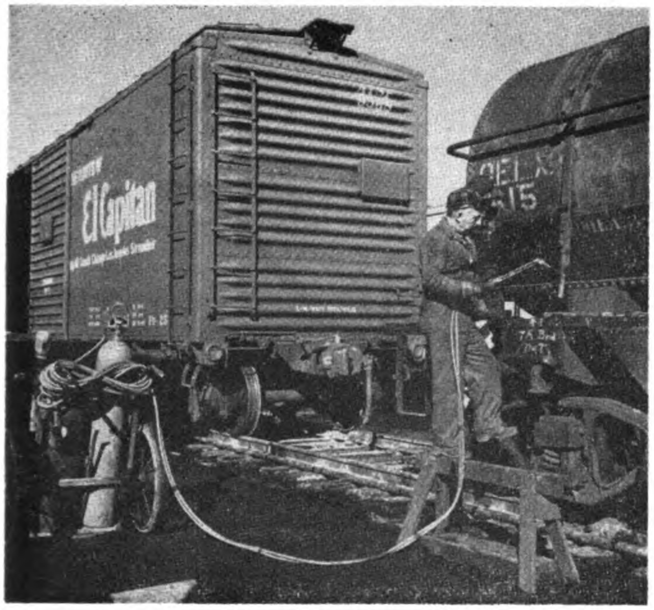
In addition to checking car bodies and running gear, the special attention given to auto-rack cars on Tracks 4 and 5 consists of close inspection of all hoisting and hold-down parts including chains and turnbuckles, which are replaced if worn and otherwise put in condition to hold automobile loads securely in place while being shipped by rail. Any necessary cleaning of bad-order and auto rack cars is done while they are on Tracks 1 to 5 in order to avoid an extra switching movement.

The freight-car cleaning operations on Tracks 6 to 14, incl., are well organized to save both time and labor. In general, the cars are first thoroughly swept out, all dirt

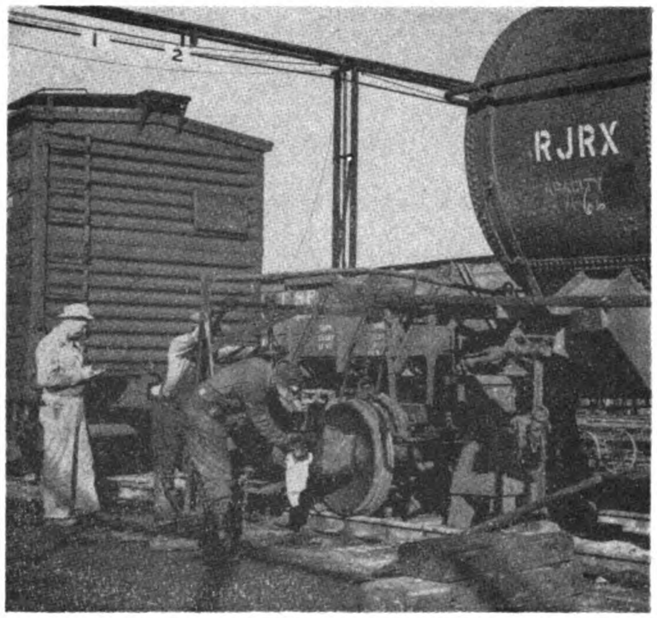
OUTPUT AT THE SANTA FE's HOBART CAR REPAIR YARD DURING FOUR MONTHS OF 1952

	February	March	April	May	Average for four months
Bad-order cars repaired	705	776	815	855	788
Daily average	35	37	37	40	37
Auto-rack cars worked	732	480	498	513	556
Daily average	36	23	22	24	27
Tank cars cleaned	135	104	122	126	122
Daily average	7	5	6	6	6
Cars cleaned and classified only	3,063	2,557	3,007	2,685	2,828
Daily average	153	122	136	128	135
Total cars cleaned and classified*	4,635	3,882	4,442	4,179	4,284
Daily average	232	185	202	199	204

* Includes bad-order cars, auto racks, and tanks cleaned as all cars not loaded are classified.



Repairing a broken tank band with portable gas-welding equipment.



Changing out a pair of defective car wheels with jacks, blocking and A-frame.

and rubbish being shoveled directly from the cars to dump trucks operated under contract and scheduled to pass up or down each track generally once a day. By spotting the trucks close to house-car door ways, refuse can be quickly and easily disposed of without getting on the ground at all.

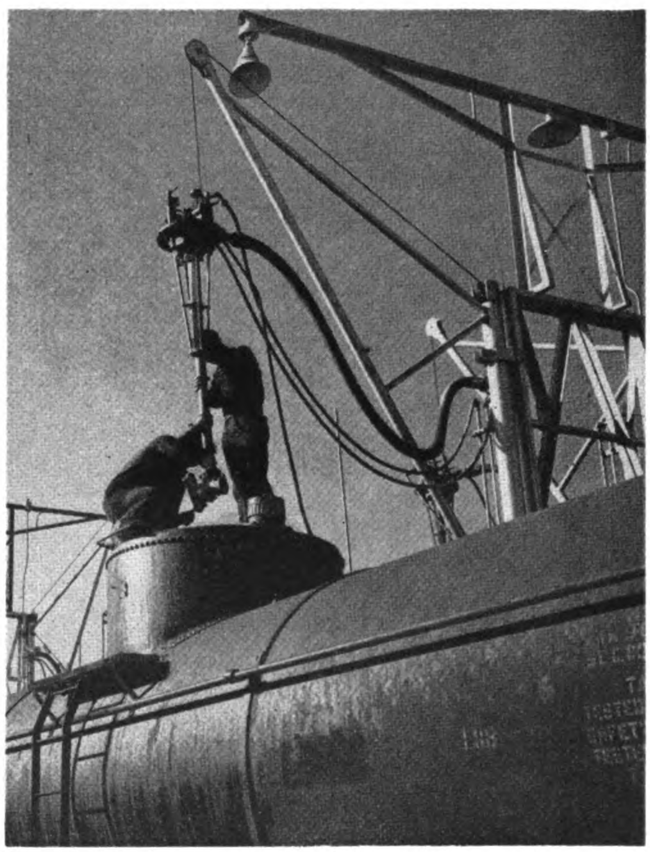
Normally, the cars are either blown out with compressed air, or, if necessary, flushed out with a powerful stream of cold water through hose connection from the nearest available water pipe outlet. Oil spots are covered with a sealer, applied with a spray gun, and other cleaning methods are used as required. A careful inspection is made for evidences of insect infestation and in some cases it is found necessary to fumigate the cars.

Covered hopper cars receive special attention in cleaning because loaded materials in so many instances are of such a character that any traces left in interior crevices or depressions will contaminate and seriously damage subsequent loads. All inside walls, slope sheets and hoppers are therefore thoroughly flushed out with clear water and carefully examined with a flashlight to see that all remains of the previous load have been removed. In some instances, after drying, the bottom hopper doors are paper lined to prevent any leakage of finely pulverized, flour-like materials, such as Filtrol powdered clay, used extensively in petroleum refineries.

Similarly, all refrigerator cars get extra attention in cleaning, floor racks being lifted for thorough sweeping and washing the floor when the side walls and bulkheads are flushed. Ice bunkers are cleared of ice, salt and accumulated trash; then being washed out. When previous loads of fish or any other commodity leave objectionable odors in cars after the first washing, they are washed again with a caustic solution and, in extreme cases, may have to be sent to the back shop for heavy rebuilding.

The tank car cleaning on Tracks 15 and 16 is a highly specialized operation requiring special equipment and methods which can be adequately covered only in a separate article. Cars are moved up to and through the tank car washing machine with a Chicago Pneumatic air winch of 2,000 lb. capacity.

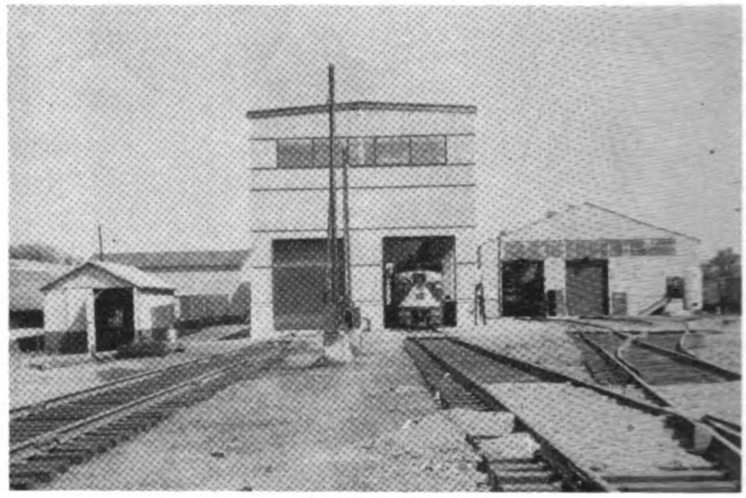
Freight cars of various types are sent to the Hobart



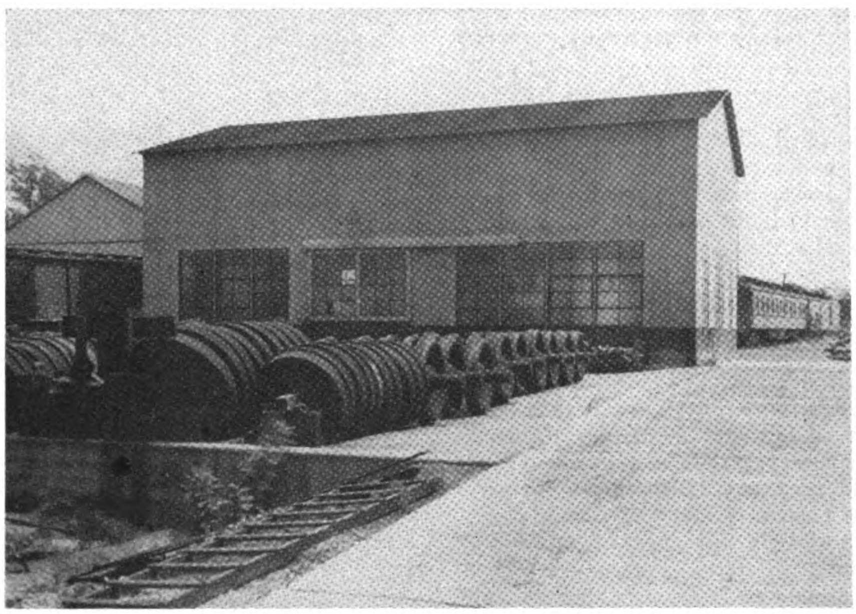
How revolving Oakite spray unit is supported while being lowered into a tank which needs cleaning.

Yard for reconditioning in accordance with traffic demands and generally switched to the various tracks during the third shift, as stated. The repaired, cleaned and classified cars are pulled once a day, except in the case of refrigerator cars or other special cars in great demand, in which case the tracks may be pulled twice a day.

One Building Houses Car and Diesel Shop



The low bay section on the right handles diesel servicing in the near half and heavy repairs to freight cars in the far half



All car wheel work except turning is handled in this small wheel-shop building.

SINCE the facilities for maintaining the motive power and rolling stock of the Ann Arbor Railroad were originally built at Owosso, Mich., two major changes have taken place which have confronted the road with a problem common to all roads in the process of dieselization. That problem is having more building space than is required to maintain the diesel fleet. but little or none of it in the right place nor with the right characteristics.

The Ann Arbor solved its problem in a manner different from that used by other roads. The reason it could, and did, employ a somewhat novel solution was based on the result of the aforementioned two major changes which took place on the line. The two changes were the gradual abandonment of passenger service and complete dieselization of all operations.

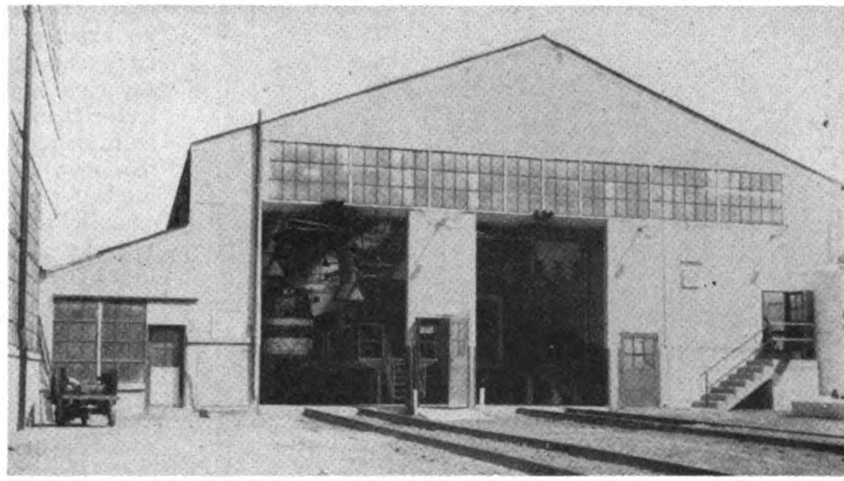
The situation was further affected by the rapidity of dieselization. Prior to December 1950 the entire roster was composed of steam power with the sole exception of one 44-ton Whitcomb switcher. In that single month the line switched over to complete diesel operation with delivery from Alco of fourteen 1,600-hp. road freight A-units, two 1,000-hp. switchers and six 660-hp. switching locomotives. This quick changeover from nearly 100 per cent steam operation to full dieselization avoided a troublesome drawn-out transition period, but it did require fast work in readying maintenance facilities for the new power.

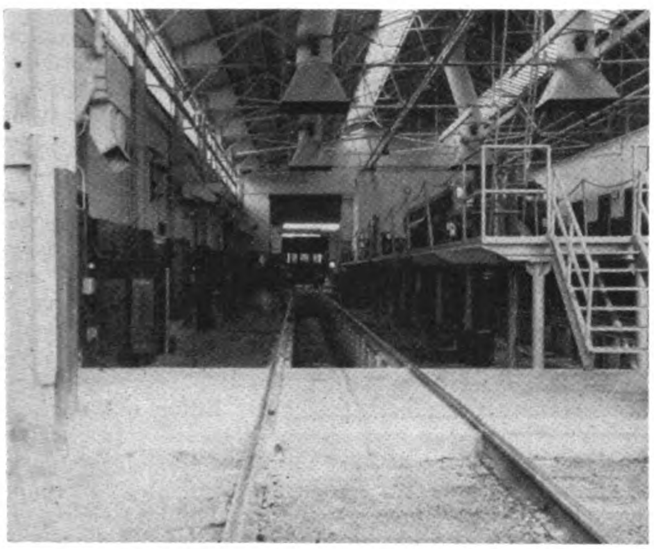
There were three principal buildings available—the old steam engine house, the backshop and a freight car heavy repair shop. The latter was a building 300 ft. long and from 64 to 80 ft. wide. Three tracks at ground level extended into this building from the rip track and terminated at the far end. To one corner of this building was attached a large wood mill.

Neither the engine house nor the steam backshop was well suited to either diesel repairs or general freight car repairs. The freight car shop, on the other hand, was quite adequate for continuing freight car heavy repairs without any change, or it could be converted to a diesel repair shop without undue expense because of its size, shape and location.

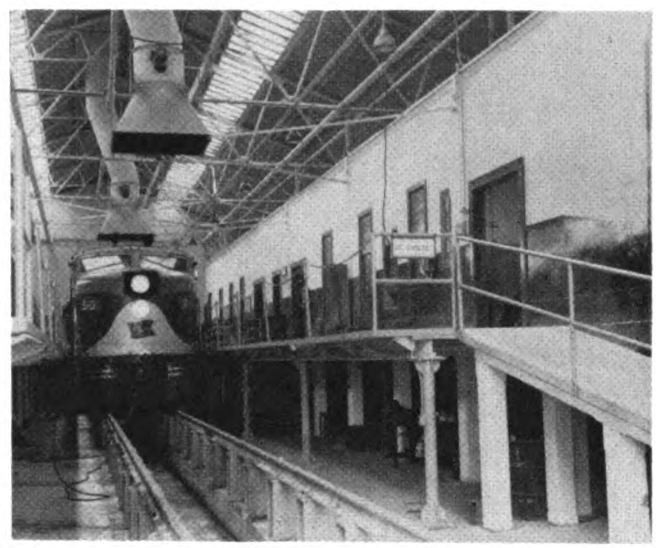
The freight car shop, like the roundhouse and the back

The small lights over the doors show if the door is raised enough to clear a locomotive—green if yes, red if no.

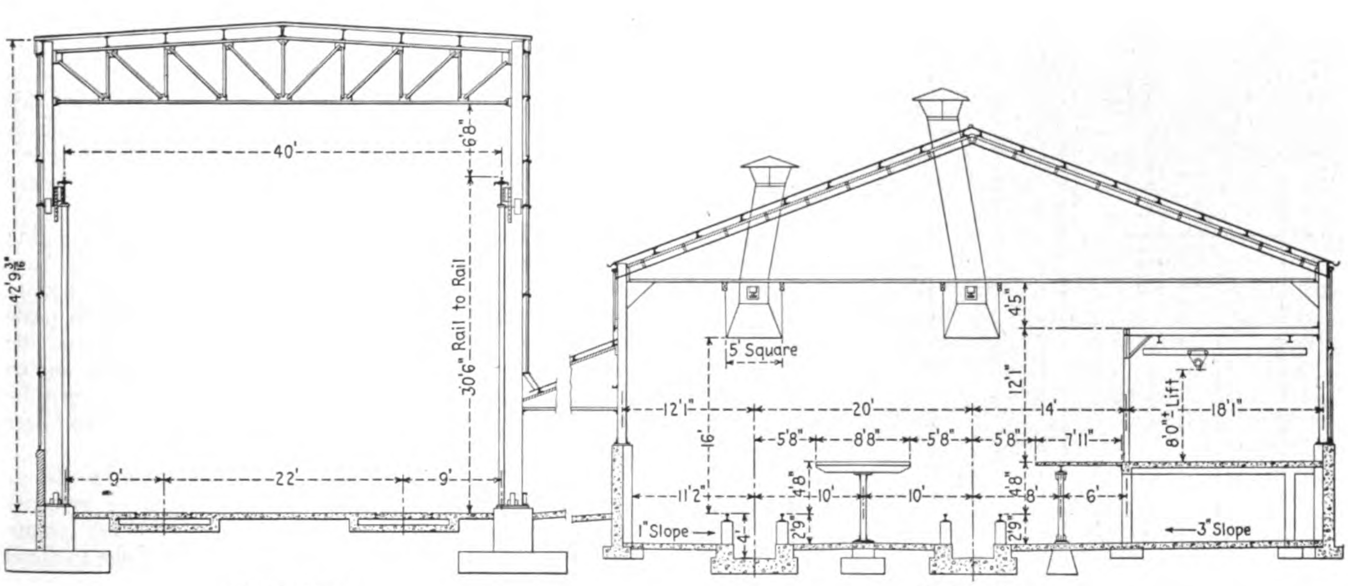




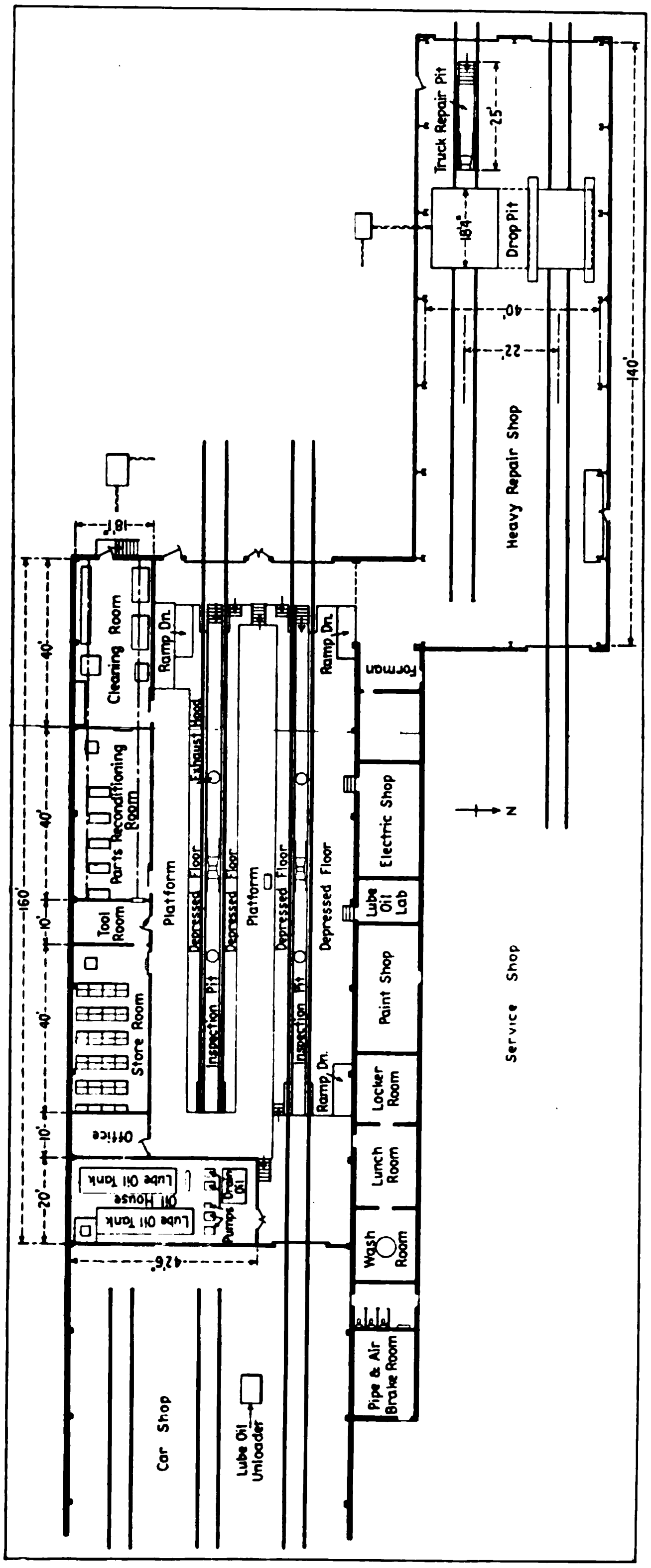
The diesel side has two tracks; the car side has three. One of the tracks extends through from one shop to the other.



The right platform leads to the diesel storeroom, the cleaning room, the parts repair room, a tool room and a small office.



Cross-sections through the diesel repair and high-bay shops.



Floor plan of the combination car and diesel shop of the Ann Arbor at Owosso, Mich.

shop, was built during the days when the Ann Arbor ran an extensive passenger service. It was therefore built large enough to accommodate both freight and passenger cars undergoing general repairs. It was therefore larger than needed to handle freight cars only, as it has been doing since discontinuing passenger service. Furthermore, the average freight car in service today is a far better car than what was used twenty or thirty years ago. It is better designed and requires less maintenance. Therefore, less shop space is needed to maintain today's fleet of Ann Arbor freight cars than was needed to maintain the cars that were operated at the time the large car shop was built.

Wall Divides Building in Two Sections

The existing car shop building was therefore divided approximately in two by a wall. Half of it is now used for car repairs, and half for diesel servicing. The latter is used in conjunction with a high-bay section built onto one corner of the diesel section where the wood mill was formerly located.

The three tracks in the original car shop were left in place in the car section, but two were terminated at the dividing wall. The third extends through to the diesel side, where an automatically operated overhead steel door closes off the opening between the two portions.

The diesel side of the building is 160 ft. long and has the aforementioned track that extends through to the car side. It also has a second track, located in line with the center track of the car section but separated from it by the dividing wall. Both tracks in the diesel section are served by locomotive-floor-level platforms, have depressed floors, lighted pits, etc., in the customary arrangement.

The high-bay portion built onto the corner of the low-bay section is 44 ft. by 140 ft., has two tracks, an overhead crane serving both tracks for lifting out engines and for other heavy work, and a drop table capable of handling four-wheel trucks and fitted for dropping a single pair of wheels. The general foreman's office is located in the corner where the two buildings join.

Rooms for cleaning and repairing individual parts are located along one side of the diesel house at platform level. The rooms now occupy the area where the removed section of the third car track formerly laid, although on the level of the locomotive floor platform rather than track level. The area under these rooms—the diesel storeroom, the toolroom, the parts repair room, the cleaning room and an office on the end of this series of rooms near the dividing wall—was not filled in. Instead, this area is used for under-platform storage of such things as the transition-testing motor-generator set, a snow melter, a battery charger, and miscellaneous large and heavy items.

One of the innovations of this shop is a square opening in the floor of the parts repair room and one in the filter cleaning room. These openings are about a yard square and are normally closed with a steel cover. When parts are to be moved between either of these rooms and the lower storage area, the cover is merely raised as shown in one of the illustrations and parts or stores can be handled quickly and directly between them and the lower storage area by cranes in these two rooms.

Another row of rooms is located along the opposite, or north, side of the building. These rooms were incorporated in the building when used exclusively for car repairs and required minor conversion only to adapt them to diesel work. The car foreman's office was changed to the diesel general foreman's office because of its strategic location between the high and the low bay sections; the water

engineer's laboratory was converted to a lube oil lab; the electric shop was left essentially as it was for overhauling small electrical parts off diesel locomotives; the wash and locker rooms were unchanged; the upholstery shop was converted to a locker room; and the car department paint shop was left as it was.

Overhead steel doors raised and lowered by electric-motor drive are installed at the two entrances to the low bay section and the two entrances to the high bay section of the diesel shop, as well as to the three entrances of the freight car shop. The two doors leading into the low bay section have a red and green light mounted over them to indicate to the hostler when the door has been raised high enough to permit a locomotive to enter. The light is green when the door is opened far enough to clear a locomotive, red when it is not.

Complete overhaul work is done on the diesel engines and on the locomotive trucks. Minor body work and electrical work are done; unit exchange is used on all parts requiring extensive electrical repairs. On the freight car end, heavy repairs only are made within the shop. The rip track is directly outside the car section and all light and running repairs are made outdoors.

Other Buildings Are Still Used

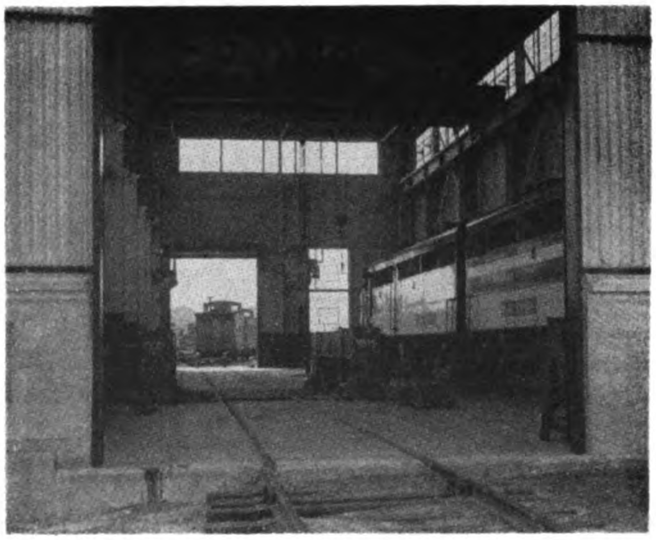
Both the diesel and the car facilities in this building depend to some extent on other repair areas at Owosso. The former steam backshop has not been torn down, nor has much of the machinery been moved. Instead it is used for such operations as turning all mounted car and diesel locomotive wheels, for mounting and demounting diesel locomotive wheels and for miscellaneous machine work that becomes necessary on either car or locomotive parts. This building, in addition to its car and locomotive shop operations, maintains all the track motor cars on the Ann Arbor, and it handles some of the heavy repair work for the marine department.

The wheel shop for the car department is likewise in a separate building. This is a small steel building with a concrete floor surrounded by a concrete storage area for both mounted and single wheels. The building itself houses equipment for boring wheels, turning journals and wheel seats, mounting and demounting wheels, etc.

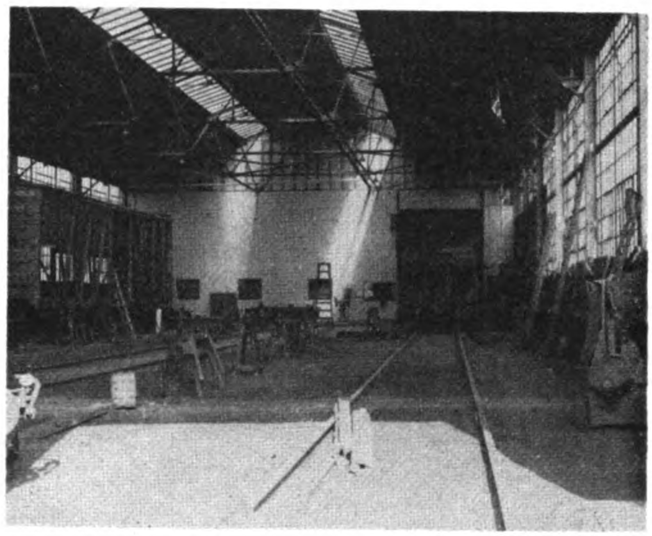
Removal of diesel fumes from the low bay area is accomplished by two exhaust ducts with motor-driven fans over each of the two tracks. Each duct is offset along its length as it rises towards the roof to clear structural members of the building. Rain is prevented from entering the building through the ducts by a cover mounted several inches above the top of the duct and extending a few inches beyond the duct along the entire circumference. Each duct is supported by the steel framing of the building through intermediate supports of wood to dampen vibrations and noise.

Better ventilation for workers inside a locomotive is attained by portable exhaust fans which hook to the door opening of road units. These fans are each driven by 1-hp. motor, and are shown in one of the illustrations.

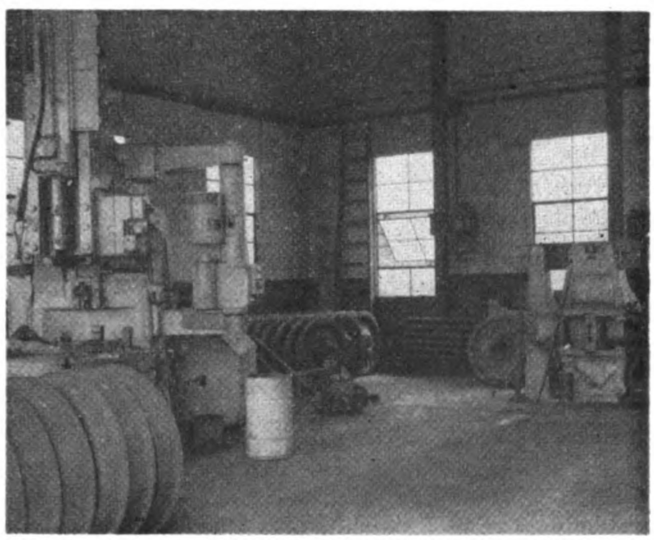
Great care is exercised in testing the oil on all Ann Arbor diesel locomotives. On road freight and road switcher locomotives, for example, the oil is tested each time the locomotive passes through Owosso, usually about once each day. The policy has been quite successful in operation; the road has never had any crankshaft trouble. The laboratory is located in the same building as the diesel shop, thus making it convenient to take the samples from the locomotives that come through. It is along the north side in what was formerly the water engineer's laboratory.



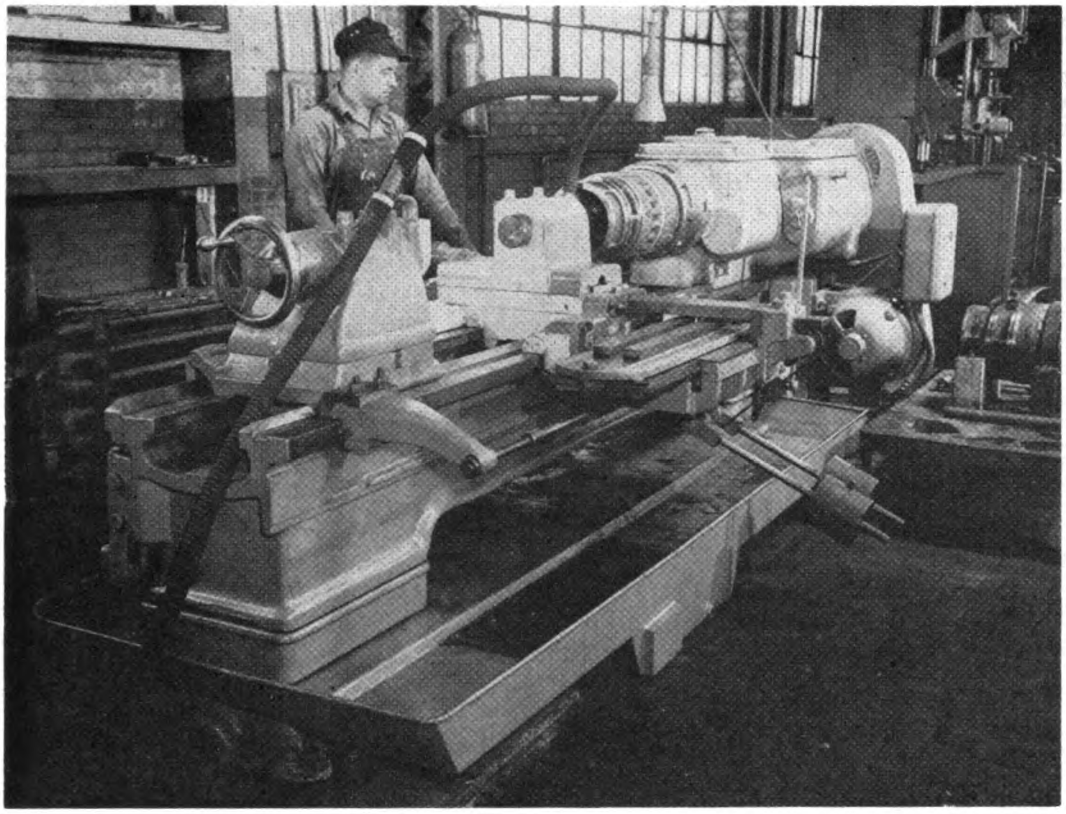
The high bay section has a travelling crane for heavy parts and a drop table for four-wheel trucks



The freight car section from the rip track, looking toward the wall dividing the car and diesel sections.



One corner of the wheel shop showing a new wheel borer and the mounting press.



The lathe for boring the liners. The counterweight arrangement keeps the boring bar in contact with the template.

How Southern Reconditions Diesel Cylinder Liners

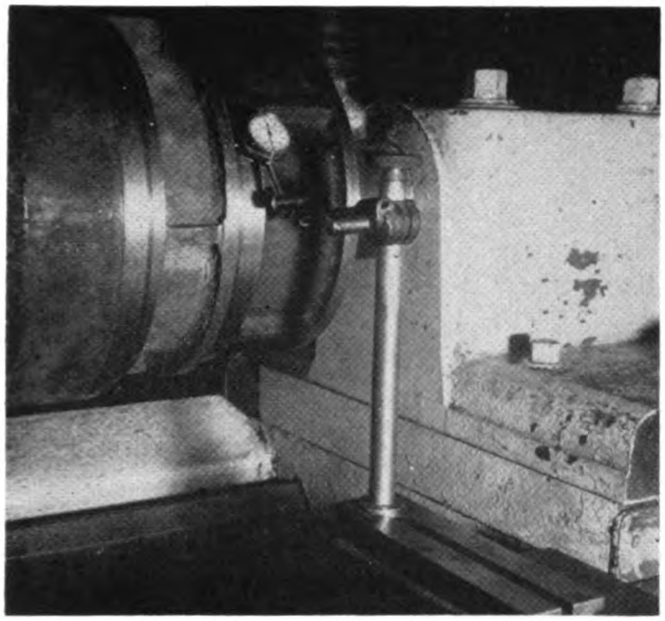
THE Southern Railway follows the practice of machining and honing all diesel cylinder liners during reconditioning. At the Pegram shops in Atlanta, Ga., the total floor-to-floor time for the operation, including all inspection, takes about 1¾ hr. Machining is done on a conventional engine lathe especially equipped for aligning the liner and for making the tool follow the template. A standard honing machine is used with a special air clamp which reduces the time required to set up the liner and, by means of the limited force with which it holds the liner, functions as a safety device. If the honing pressure becomes excessive, the liner slips and turns in the clamp. The engine lathe-hone combination handles all liners for over 600 diesel units.

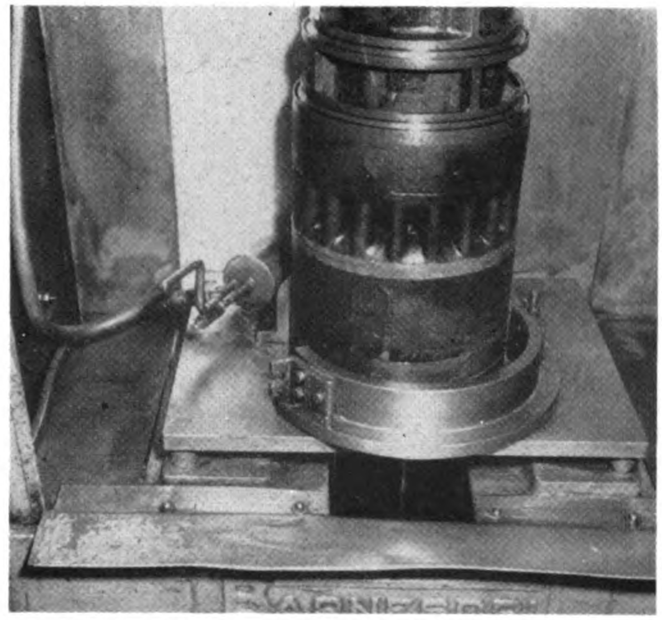
Lining up the cylinder for the machining operation is quick and simple. A valve bushing has been bolted to the face plate of the lathe with cap screws. The cylinder studs fit through the face plate, and nuts secure the liner to the valve bushing. As the top and top face of the liner are machined surfaces, the end of the liner near the face plate, or the top, will run true. The bottom of the liner is aligned to run true by tightening up on the stud nuts. A surface dial gauge mounted on the lathe carriage checks the trueness of the running of the liner. The pointer on the dial gage contacts the bottom seat seal which has been cleaned up for this purpose.

Normally one pass of the cutting tool is sufficient. Carbide tools are used with a .004-in. feed at a speed of 200 r.p.m. If more than 0.20 in. need be removed, a second cut is taken, but it is seldom that cuts of this amount are necessary A special forming tool is used for chamfering the bottom of the liner. The top end is chamfering the bottom of the liner. The top end is chamfered fered by the boring tool. This latter chamfer and the center relief groove, or "Mae West", is put in by the boring bar which follows the template for the complete boring operation. The boring bar is caused to follow this template by two weights attached to the boring bar housing through a chain and sprocket to hold it against the template.

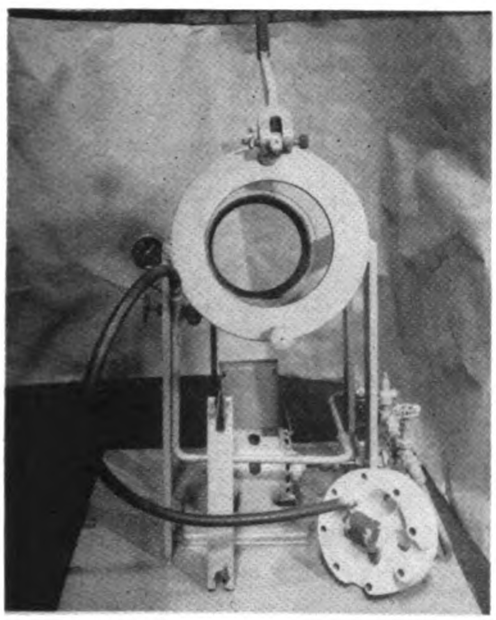
Liners are finished to either one of two overside step sizes, .030 in. or .060 in. They are bored out to .029 or to .059 in. oversize on the lathe, and the final .001 in. is removed with the hone. The machining time requires about one hour and the honing time about 10 to 12 min. The floor to floor time for honing is about 15 min. Cutting oil for the honing operation is a mixture of about 2/3 kerosene and 1/3 standard cutting oil. Dust and shavings from the machine operation are removed by a vacuum tube mounted on the boring bar.

The air clamp on the honing machine is of the hinged split-ring design and is operated by an air cylinder 3 in. in diameter with a 4-in. stroke on about 60-lb. air pressure. The piston has a direct contact to the ring, with

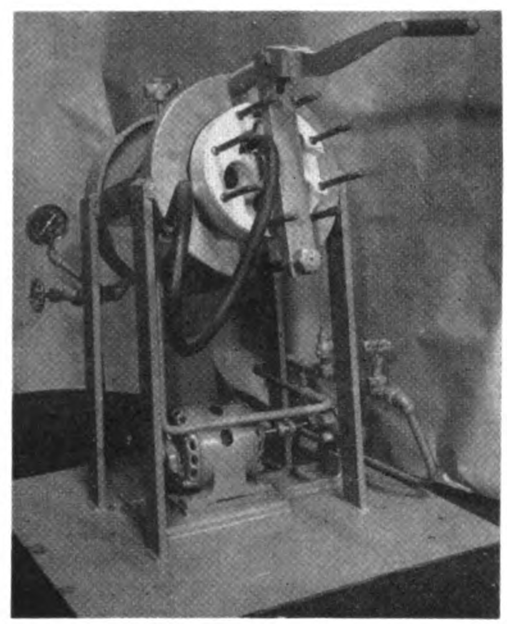




A dial gage (left) is used to align the bottom of the liner to run true. The liner (right) is held in the honing machine by an air clamp which is quickly secured and which protects the liner against excessive honing pressure.



Drum and dummy head used for testing cylinder liners after machining at 100-lb. pressure.



Remachined cylinder liner being tested for water tightness.

the end of the piston rod threaded for moving a stop which accommodates different size liners.

The seat in the bushing which is attached to the lathe face plate is refaced about once every six months. Other maintenance required on the machine is checking twice a week with a surface gage to make sure that the boring bar runs straight. The seat seals on the liner are checked with a pair of "go" gages.

At the Pegram shops a test stand with a dummy head is used for testing Diesel cylinder liners prior to application to the engine. Cold water at 100 lb. per sq. in. is used for testing liners after re-machining.

The jacket assembly fits into a drum fitted with a vent valve on top to exhaust the displaced air. The water jacket is filled from the city water line, after which the 100-lb. pressure is built up by a 3-g.p.m. electric-motor-driven pump. A check valve incorporated in the piping closes off the pump delivery line and the jacket inlet line from the city line to permit the pressure to be built up. The top of the jacket is closed off by a soft rubber gasket and a 3-in. dummy head. The dummy head has a partial-circular section of steel 3 in. long with a $1\frac{1}{2}$-in. radius welded to the center. This piece mates with a cam on the handle to lock the dummy head tightly in place.

The drum into which the liner assembly fits is supported on two sets of uprights. One pair is $\frac{3}{4}$ in. by $3\frac{1}{2}$ in. by 34 in. The second pair is $\frac{3}{4}$ in. by 3 in. by 32 in. The two pairs are $13\frac{1}{2}$ in. apart on centers and support the drum at an angle of about 15 deg. Both pairs are welded to a base plate $\frac{3}{8}$ in. by 40 in. by 40 in. The drum has an outside diameter of $18\frac{1}{2}$ in., is made from $\frac{3}{8}$-in. boiler plate, and is of all-welded construction. The lower head has a double seat as in the engine cylinder and is sealed by regular service gaskets.

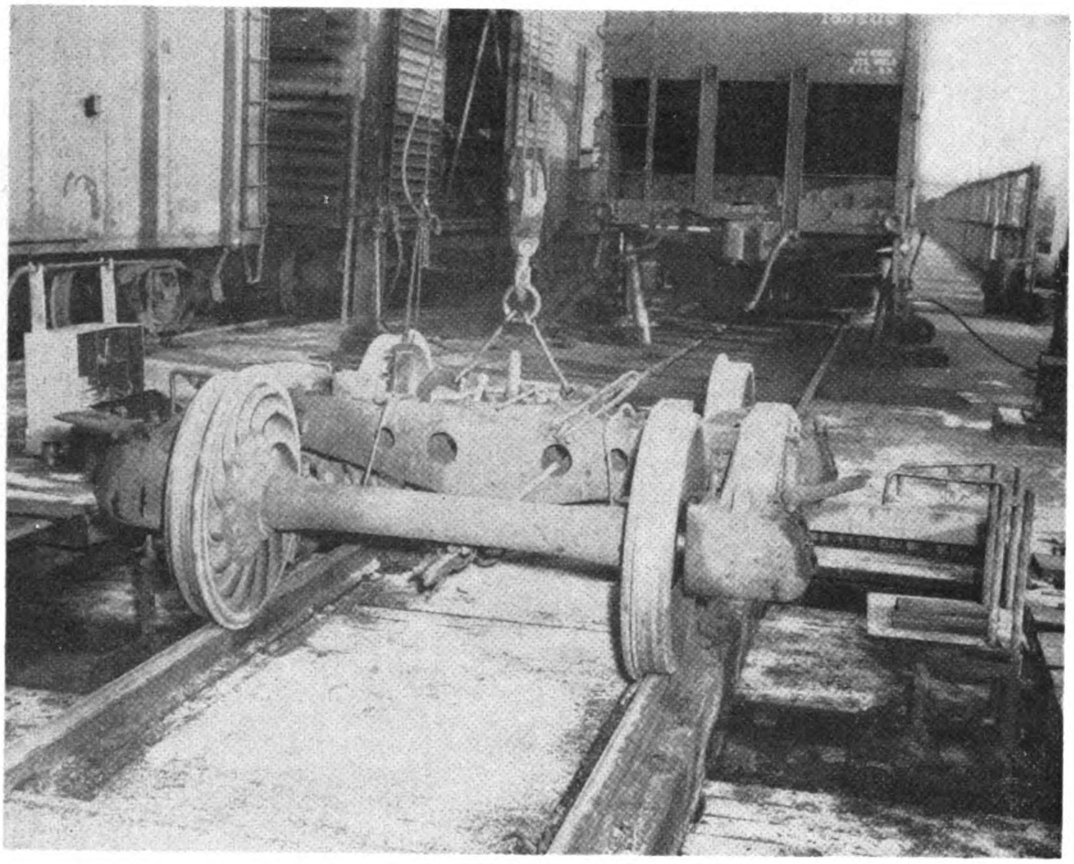


Fig. 1 — A dolly ready to be moved into position for supporting the side frame on the right.

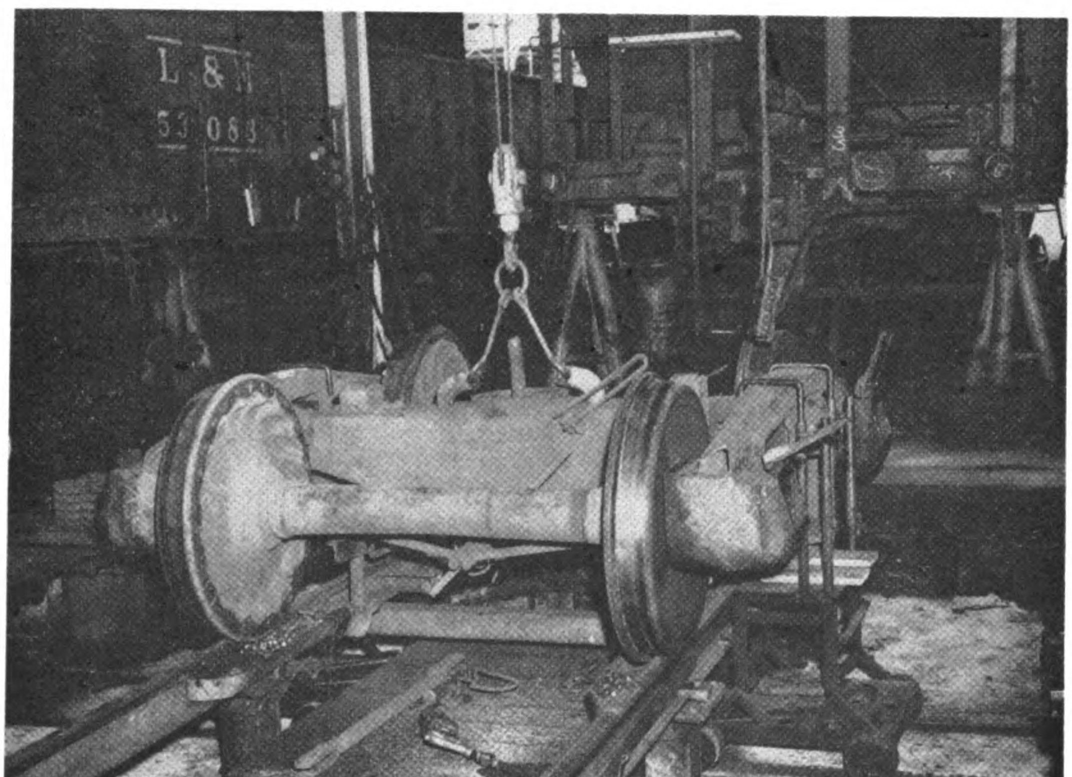


Fig. 2 — How the dollies support the side frames for movement to the pit sides and overhaul.

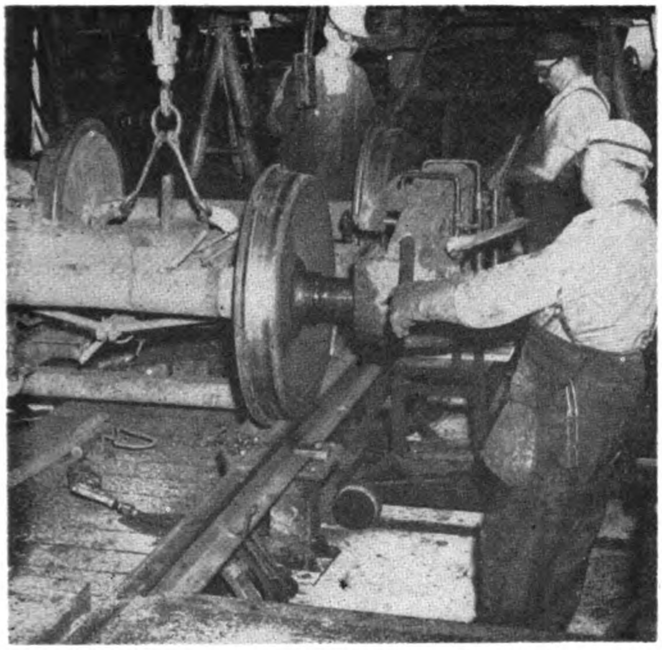


Fig. 3—With the side frame securely supported by the dolly, it is moved by hand to the recess in the side of the pit.

Fig. 4—With the dolly supporting the side frame in the recess, the boxes can be cleaned without interfering with other work.

Indoor and Outdoor Pits for Truck Repairs

Two types of pits designed for specific operations are equipped with facilities to suit those operations

THE Louisville & Nashville has constructed pits at its South Louisville shops for making complete inspection and repairs at a single location to freight car trucks, couplers and draft gears. The pits are installed at two points. One is on the rip track and is served by an overhead monorail crane. Four are within the heavy repair shop.

By concentrating all work on each truck and its associated parts at a single pit, unnecessary steps are avoided, and tools and materials are within easy reach. Furthermore, one foreman can easily supervise all work and material under his jurisdiction. The truck pits enable the railroad to save approximately 80 mechanic hours per day on the heavy repair tracks as compared to the old method of truck repairs wherein the work was handled at several locations in the shop.

The pits themselves are essentially the same at both the inside and the outside locations. Both groups are served by overhead electric cranes, have the same dimensions, and are similar in layout and equipment. The pits are 16 ft. long by 13 ft. wide, exclusive of a recess on each side for a dolly that holds the side frame.

In each case the truck pits comprise a pair of rails at the ground or floor level and a depressed area on either side of the rails. The depressed area is 1 ft. 10 in. below the top of the rail, and is 4 ft. wide by 16 ft. long. One of the few differences between the outside and the inside pits is that the area between the rails is filled in on the outside whereas it is depressed 1 ft. 10 in. on the inside pit, the same as the area on the sides of the rail. The only other difference of any consequence between the indoor and the outdoor pits is that the indoor pits have individual racks along the outer edges for storing tools and small replacement parts.

All the pits have four-wheel dollies, two to each pit, which run on a pair of narrow gage rails perpendicular to the main track (Fig. 1). The dollies support the side frame after the bolster has been lifted by the crane (Fig. 2). They have a platform which slips underneath the truck side frame to remove it clear of the truck working area, and a pair of uprights with a hook top to secure the side frame to the dolly for the movement.

The indention in the sides in which the dolly and the side frame are stored during truck overhaul is 2 ft. wide and 3 ft. long. When the dolly is wheeled back to the extreme edge of this indention it and the side frame are completely out of the way (Fig. 4). No crane is tied up in the movement and the need for finding a place to store

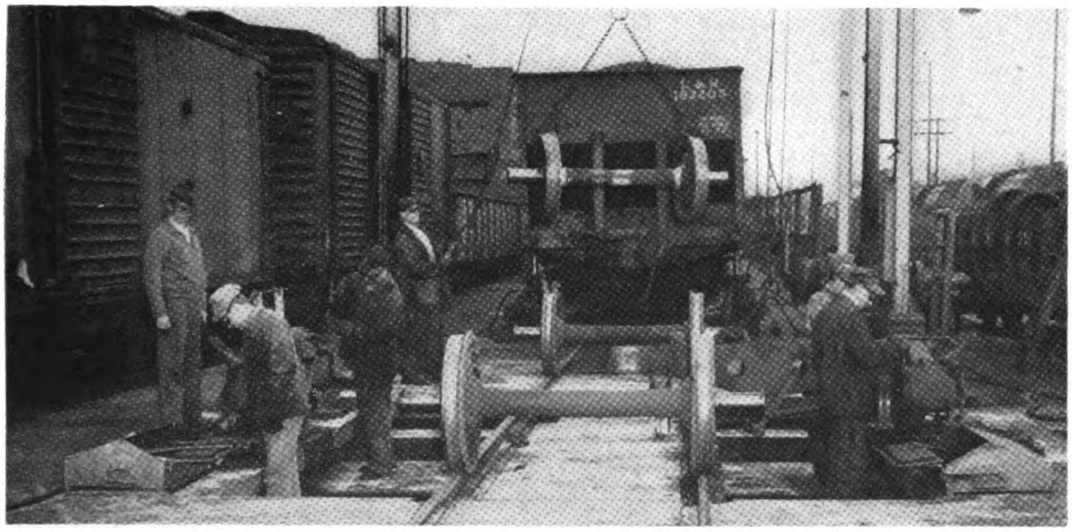


Fig. 5 — Tools and materials are close at hand for cleaning and overhauling components of the dismantled truck.

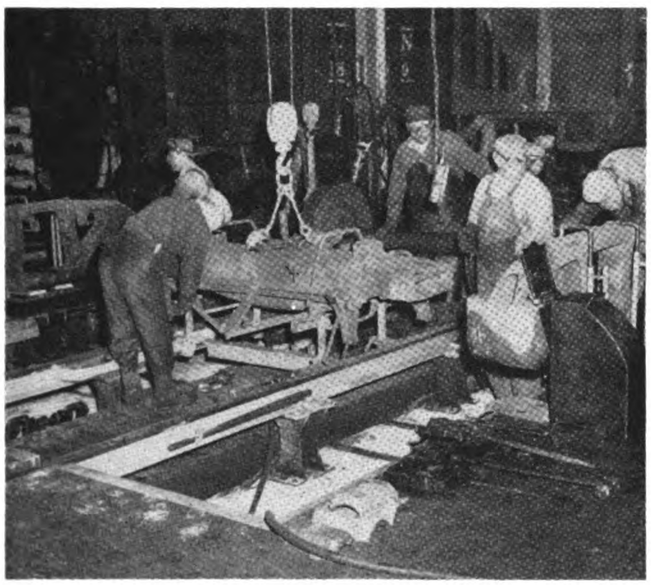


Fig. 6—With the dollies holding the side frames in recesses the journal-box refuse is caught in the metal container at the right.

the side frame is eliminated. At the same time the side frame is supported securely at a comfortable working height with ample surrounding working space for renewing the dust guards, cleaning out the journal boxes and any other work required on it.

The inside pits are equipped with lightweight metal containers (Fig. 6) which fit up snugly against the journal box opening on the outside to collect the dirt and refuse cleaned out of the box during the overhaul.

Crane facilities differ between the inside and outside pits. Each inside pit is served by two monorails running perpendicular to the shop tracks with a one-tone hoist for handling couplers and a two-ton hoist for lifting and holding the truck bolster. The outdoor crane is a monorail laid out roughly in the shape of a capital letter *P*, with an additional monorail approximately in the center of the loop and perpendicular to the main stem (Fig. 7). The outdoor crane has a two-ton hoist for handling wheels and couplers and a three-ton hoist for the bolster. All cranes, indoor and outdoor, operate on 230 volts d.c. current. A switch was developed where the loop joins the main stem so that the two-ton hoist can travel the loop and rejoin the main stem (Fig. 8).

Outdoor Pit Operations

So that all frequently used tools and materials will be concentrated in a relatively small area around the pit on the rip track, a wheel car which holds from 18 to 20 mounted wheel sets is spotted near the pit on an adjacent track (Fig. 9). The car is located so that it is served by the overhead monorail crane to eliminate the problem of getting the good wheels to the rip track and the defective wheels from the rip track. The storage car holds the wheel sizes most commonly used. As the car is switched into the storage location it contains all good wheels. As the good wheels are removed from the car the defective wheels which they replace are loaded onto the car. When the car is full of defective wheels it is exchanged for another car having all good wheels.

Wheel sizes that are required only infrequently are stored beyond the wheel car on the same track. The overhead monorail crane extends into the area for storing odd-size wheels.

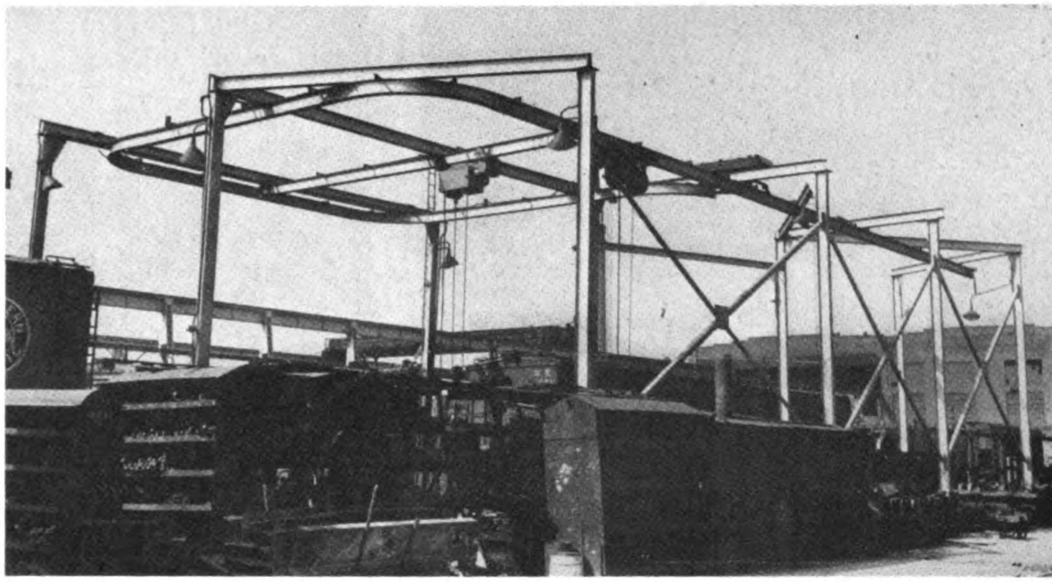
Storage area alongside the rip track truck pit is provided for center plates, brake beams, truck bolsters, side frames and other materials needed in rip track work. A 10-day supply of all parts is kept on hand. As the storage space is outside the area served by the overhead crane, heavy parts, such as bolsters and side frames, are handled by lift truck to the truck pits.

Cars found with wheels defective at yard inspection have a special red tag marked "wheels" affixed. This red tag tells the switchmen that the car is to be placed on the rip track equipped with the special truck pit. This is an open track on which the operating department switches cars in and out, and on which both empties and loads are worked.

Each car to be worked is spotted by a car puller with the end to be worked placed next to the pit. A sheave on each side of the pit and 25 feet from the edge positions the car for raising the end by pneumatic jacks. Other sheaves are located along the rip track for moving cars greater distances.

Work begins on the truck after it is rolled out in the conventional way with the car end jacked up. The bolster is lifted by the three-ton hoist of the overhead crane while the four-wheel dollies on each side support the side frames for replacing the dust guards, cleaning the

Fig. 7—The monorail crane, with two hoists, which serves the outdoor pit.



boxes and any other work required. The side frames rest on wooden blocks of three different thicknesses to accommodate different designs. The boxes are cleaned by blowing out with air and wiping with dry rags after the heavy grease has been scraped off.

A small metal locker at the outdoor pit holds the tools necessary for removing brasses and for cleaning the brass and wedge, also gages for the wedges. New dust guards, etc., are stored near by. Metal blocks 9 in. by 12 in. by $2\frac{1}{2}$ in. are located at the corners of the pit for sound-testing brasses.

Pits in the Car Shops

Four pits are installed on two tracks inside the freight car heavy repair shop. The layout of these pits is essentially the same as the outdoor pits. They are, however, somewhat more completely equipped as all trucks are dismantled for repairs which are made to the truck at this

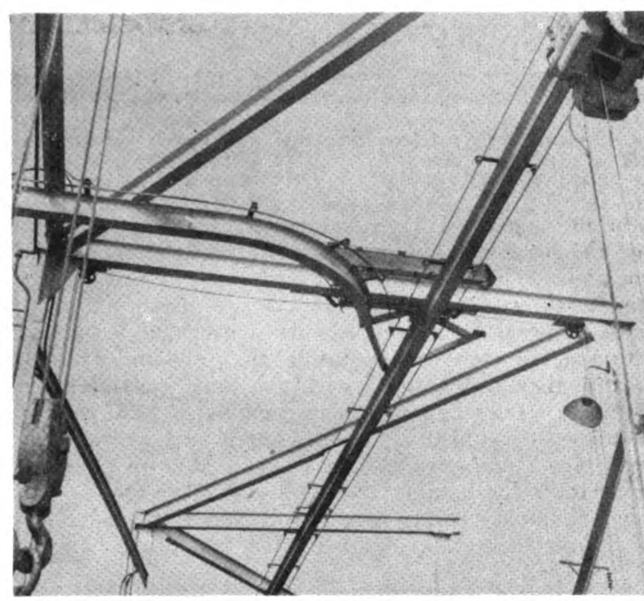


Fig. 8 (right)—Switch arrangement to permit the two-ton hoist to travel around the outdoor loop and rejoin the main stem.

Fig. 9 — The rip track pit with the side-frame storage area and the wheel car on the right.

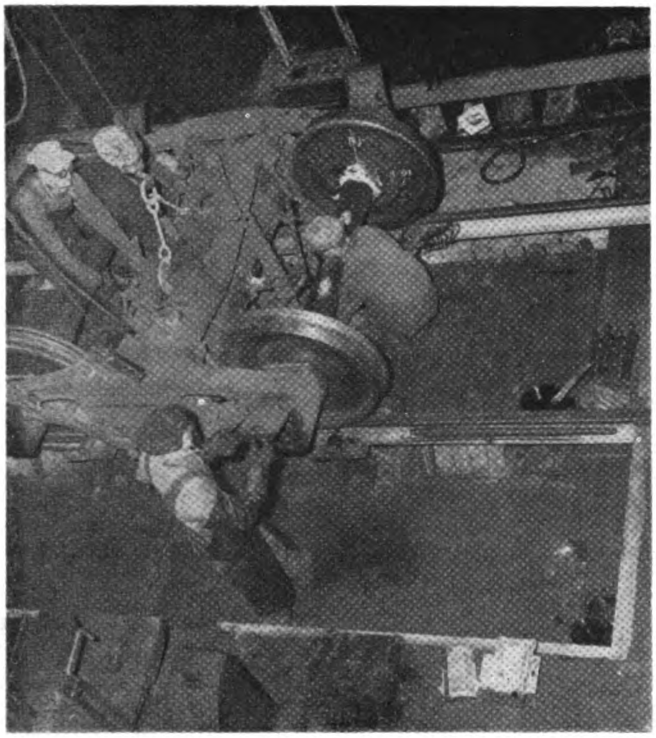


Fig. 10—Small parts and tools are stored in bins while crowbars are held by clips on the rails.

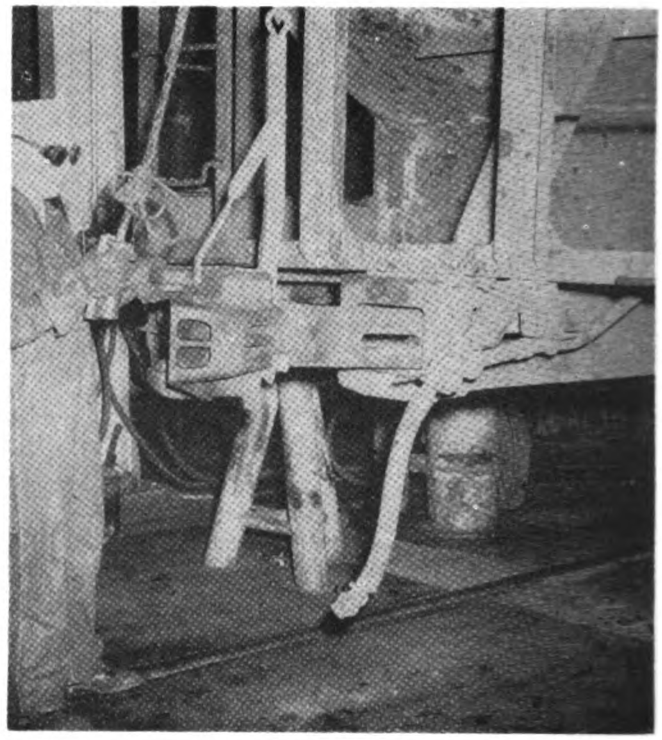


Fig. 11—An auxiliary job done by the indoor truck pit crane is hanging couplers with the aid of this special hook.

location as part of a general car overhaul rather than just the necessary running repairs done on the outside truck pit. The near edges of each pair of pits on the same track are 16 ft. apart.

All material for a complete truck overhaul is located within a few steps of the inside pit. The indoor pits, because they do complete overhaul work and therefore require a steady flow of replacement parts, have certain features not included in the outside pits such as trays for small pins, cotter keys and washers and clips on the sides of the rails for holding crowbars and other tools. The side walls hold springs, dust guards, box lids, plugs, box lid pins, truck shims, bolster shims and brake hangers (Fig. 10). Each of the four pits is also equipped with metal boxes which have openings to mate with the journal box openings to catch the dirt and trash shoved and blown out of the box.

Two devices are used in conjunction with the overhead crane while the car is at the truck pit work location. One is a special hook (Fig. 11) for hanging couplers which is shown in one of the illustrations. The second is a pair of small tongs to put the draft gear and yoke combination on a wagon which is equipped with an air cylinder to raise the draft gear equipment into place. The carrier rests under the draft gear on the wagon (Fig. 12) so that when the gear is raised the bolts can be dropped in.

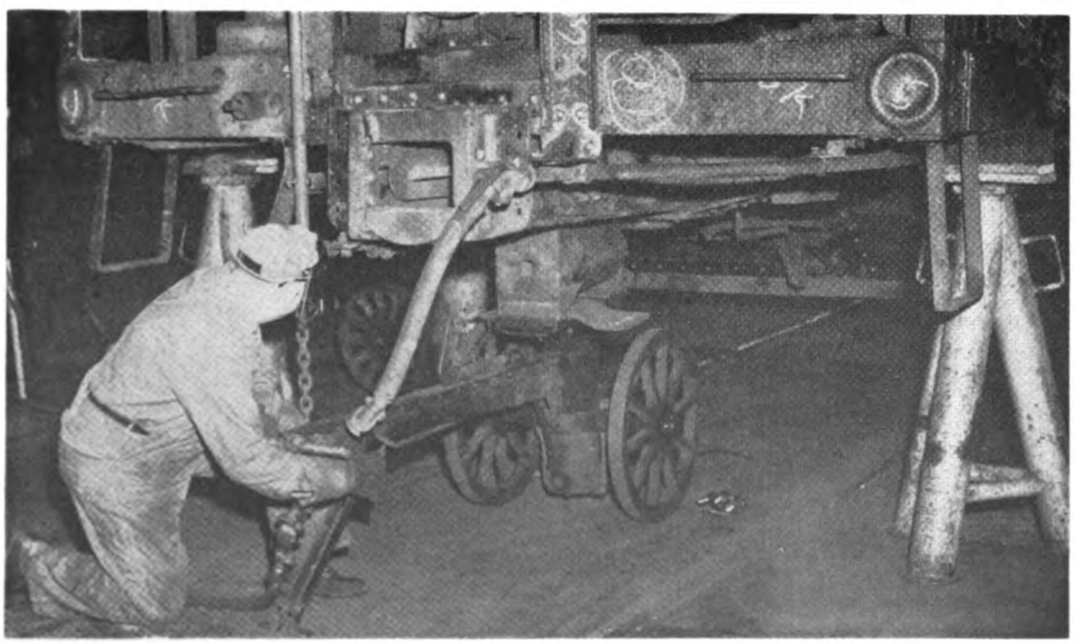


Fig. 12—Air-cylinder-equipped wagon for applying the draft gear and carrier.

How to Determine What Diesel Facilities Are Needed*

THE most important problem when providing diesel facilities is careful planning. One railroad which foresaw the extensive use of diesel power in 1947 arranged for a survey to plan for motive power and facility requirements. The first survey covered a five-year period. A year later, in 1948, this developed into a 10-year study and, to date, the roads acquisition of power and facilities has followed this plan with few modifications.

Facilities for the Smaller Roads

It is true that no one plan could be developed that would fulfill the requirements of all the smaller roads. Each railroad has its own specific problems to meet and incorporate into a master plan. This report will outline the items that must be considered, and give the possible mistakes that can and have been made in the past. For we profit much by past mistakes. We can then in effect, do like a person planning on building a home, examining many different plans, and trying to incorporate into one plan the various ideas best liked or fitted to his needs.

The first thing to consider is the location of the various diesel facilities particularly the one at which the mileage and heavy maintenance work will be performed. In many cases this facility was located at the middle point where the steam power was previously maintained, due to the thought that existing facilities could be converted cheaper than new facilities could be built. In the steam days, power going in a certain direction was cut out at this point and fresh power cut in. All runs through this point being normally through runs, there being no natural lay-overs. In order to get the maintenance on the diesels certain runs have to be cut out and fresh diesels cut in. This takes more diesels in the pool. Suppose that a couple diesels could be eliminated in the pool by locating this facility where natural lay-overs could be utilized for the maintenance period. This money would go a long way towards the cost of a complete new facility. The utilization of the diesells would also be better.

Let's take a specific example: Between Points *A* & *C* we have a number of passenger runs. At Point *A* we have natural layovers of eight hours or more on most of these runs that could be utilized to take care of the maintenance of these passenger diesels. If the maintenance point was located at Point *B* it would be necessary to cut in and out to get the maintenance on these passenger diesels. Result more diesels in the pool, also possible delays due to cut in. Suppose we also have freight runs between Points *AC* and *AD* with natural lay-overs at Point *A*, where all normal maintenance could be performed during these lay-overs. With the maintenance point at *B* cut-ins would be necessary. Result more diesel locomotives in the pool and less utilization of power.

If the decision would be that Point *A* is the desirable place to locate the facility, then several more factors would have to be considered.

1. Does the company own sufficient ground at this point for the facility or if not, could it be secured and at what cost.
2. The man-power question; would it be available? Could the necessary forces be moved from *B* to *A*? What would be the cost to the employees or community?
3. Would it be advisable to perform all mileage maintenance work at Point *A* and still maintain Point *B* for heavy overhauls and repairs or do all the work at Point *A*.

The smaller roads do not have the staff of experts to evaluate all the questions nor can they afford to make a mistake as a larger system might. Therefore the question of location must be considered from all possible angles and given careful consideration, looking into the future as much as humanly possible.

Having made a decision as to location, the next question is the facility itself. If an existing facility is to be converted, then there are certain limits which will govern. If a complete new facility is to be built then there are no limits.

The first thing to consider is the number of diesels to be maintained at this point when completely deiselized. This will govern the size. In many cases they were built too small with no possible way to enlarge later. The plan should include possibility of expansion. It is almost safe to say that most of the existing facilities were found to be 25 per cent too small within the first year after erecting, to efficiently take care of the work. No safety factor was allowed. This also holds true in regard to parts repairs and reclamation space. This usually starts out on a small scale and is gradually increased as experience is gained. There is no limit to which it can be carried. When a part can be repaired cheaper than it can be sent in for unit exchange or repair and return, then the road must take advantage of this fact, for every dollar saved on parts can be utilized for labor. Therefore a program must be worked out as to the extent of repairs and reclamation in the future and space alloted accordingly. The tabulated third section should be a guide for this phase.

The next question is how many units will normally be operated together? Give this serious consideration. For when it is first decided they will be operated as two unit jobs, you will find later that there will be three unit jobs or more, and the possibility that the number of runs will be reduced and the pulling power increased. This will be a factor in the length of the stalls. Facilities are frequently built to handle only two units on a stall for regular maintenance, making necessary parting and assembling units. This takes time and man-hours, of which most of us do not have a surplus. This need not be considered in the heavy repair or overhaul section.

* Abstract of a report presented at Chicago at the September 15-17 meeting of the Locomotive Maintenance Officers' Association by a committee of which H. E. Nilsch, superintendent of motive power of the Elgin, Joliet & Eastern was chairman.

Next we will consider what the running repair or mileage maintenance section should consist of.

The depressed floors appear to have a definite advantage. The platform should be built of the T-type construction, if possible. They can be constructed with good head clearance. Lights should be installed in the pits and the under portion of the platform as well as above the platform. The combination of depressed floors, raised tracks, and T type platforms give good visibility, easy access to underneath parts, and make good housekeeping an easy task. Ramps should be built leading to the depressed floors. A pipe line can be run alongside each track with outlets conveniently located, to which short sections of hose can be attached. This pipe line to be run to an underground tank. When necessary to drain lube oil from a diesel a short hose section is connected to the engine lube oil drain and to the pipe line. The oil will flow by gravity to the storage tank. When this tank is full the oil can be pumped out and reclaimed. This same type of system can also be installed to supply lube oil to the diesel from storage tanks, by addition of a suitable pump. Oil can be purchased cheaper in tank car lots than in barrels, with a further dividend in saved man-hours and safety. Water lines, with connections below and above the platform, should be built to supply both cooling system water and steam generator supply tanks. Condensate from a power house can be supplied to a tank and pumped into this system. Air lines should be similarly constructed.

An external plug in system for battery charging is a definite asset.

A drop table should be constructed in one of the stalls, for truck changes.

A filter cleaning room should be constructed on the platform level, with adequate storage space for clean filters. This includes filters of all kinds. A modern semi-automatic air filter cleaning and oiling machine will pay for itself, and do a better job, besides a dividend in cleanliness and safety.

A small work room is also advisable along with a tool crib. These also to be on the platform level.

The question of a guard rail around the platform is open to debate.

Offices if any, should be on the platform level. An adequate record system must be installed so that the history of every diesel part can be recorded.

A paging system operated from the office and platform is a definite asset.

If possible, this section should be a put on and take off section, with all repair work or reclamation done in other sections. This holds true especially if there is a heavy repair section. The air room and tool room sections can be utilized for this class of work.

Proper ventilation, can be costly, yet is very much needed. This has not been completely answered and yet held to a moderate cost. Many methods are being used. With a high ceiling it doesn't cause too much trouble except for the crane operators.

Cranes or other lifting devices should be sufficient to do the work to be performed in this section.

The overall inside construction should be such that it lends itself to good housekeeping, with a minimum of man-hours. Walls and ceiling painted a light reflecting color. The floors should be painted. It should reflect an atmosphere of cleanliness.

Where possible there should be an emergency exit for each stall. This applies in the main to converted facilities.

The heavy repair section is in most cases satisfactorily served by using the erecting shop or heavy overhaul section of the steam days with very few alterations. The crane service is in most cases satisfactory. Portable platforms can and are being used with satisfactory results. A separate room should be constructed for an engine overhaul room. A track can be constructed leading into this room and the engines rolled in and out on a special constructed dolly. It should have monorail over head hoist. Shelves should be constructed to hold part removed and to be applied. A complete set of tools needed for this work can be placed on a board fastened to the walls. The removal of machinery no longer needed will usually give sufficient space for parts repair and reclamation work. Much of this work can be placed in the air room and tool room sections by expanding these sections. These repair or overhaul sections should be divided into small sections with the proper tools and instructions at each section for the work to be performed there. Racks can be easily and cheaply constructed for tearing down and assembling trucks, holding the trucks at a convenient working level. The electrical section will need the most alterations, depending upon the work to be attempted. A dipping tank and drying oven will in most cases be a necessity. Test racks of various kinds will be needed. This department should also be divided into small sections with the proper tools and instructions at each section for the work to be performed.

Where the running repair section is in this same building a store department room carrying the smaller and commonly used parts should be considered.

The usual parts cleaning facilities used in the steam days will in most cases prove satisfactory. It might be necessary to construct a few tanks for small parts.

Load testing is a necessary part of good maintenance. This should be done either in a separate building or means provided to carry away the fumes and dampen the noise.

Outside Facilities:—There of necessity must be a turntable or a wye. The wye gives less maintenance problems and can handle more units, but usually takes a little more time for turning. A turntable can be a bottle neck.

There must be proper sand drying facilities and sanding stations. There are some semi-automatic sand drying systems in service that are paying good dividends.

The wash rack should be of concrete, well drained, with facilities for spraying trucks, underframe, and car body. Steam and water must be available. If a washing machine is not needed or considered too costly cheaply constructed car body spray system can be installed.

A fueling station will be needed with a sufficient storage capacity.

Where possible fueling, watering, and sanding should be a one spot operation.

An outside inspection pit may be desirable.

All the outside facilities should be so located that the diesels can be completely serviced on one track leading into the facility.

Facilities for Larger Railroads

The first, and of course, the foremost consideration would be the operation of the railroad as to its need for strategic placings of shops. This will be left to the discretion of each railroad, as it would be foolish for this committee to attempt to set up a program of placing shop facilities for the different railroads. Every railroad has its different layout; therefore, we shall dwell in generalities as far as shop facilities and the placements are concerned.

The time is now here when some railroads have reached the point of complete deiselization, while the remaining railroads that have not are planning for this in their

diesel facilities. The foundation of our planning for diesel facilities must be based on the words "complete dieselization", for to plan without these two words in mind we would be doing as was done several years ago when turn-around points were made and set up for diesel locomotives. No longer can this type of planning be used for future diesel locomotive maintenance.

There could be three classifications of diesel facilities. The smaller running repair point where a few diesel locomotives are maintained; the second type facility would be the larger maintenance point where a greater number of diesel locomotives are assigned for maintenance; the third type would be the back shop where locomotives are given classified repairs and diesel engines, traction motors, main generators, auxiliary generators, etc., are rebuilt.

The small maintenance shop has to have to a certain extent the same facility as the larger maintenance shop, with the exception that we would not need as large a facility.

The fueling facilities on most railroads are standard in that boiler water, engine water, and fuel are available to be placed on the locomotive at one stop when fuel is being delivered to the locomotive. The swivel type swing-to facility has become the most generally used type fueling facility.

The sanding facilities at the smaller turn-around points are not as elaborate with overhead pipes from one centralized drying unit as at the larger railroad terminals, but many railroads with their own ingenuity have installed their own sanding equipment in that the sand is delivered adequately from overhead tanks in a dry, ready to use condition.

Following the fueling track it is well to plan on adequate cleaning facilities for cleanliness on diesel locomotives is essential. Many pages have been and shall be written concerning cleaning so we shall only say "Make your plans for cleaning," as a clean locomotive is a safe operating locomotive and a better one in the long run, saving the maintenance people much work and the railroad much money.

After we leave the cleaning track, as to whether or not we would cross the turntable would be dependent upon whether this shop had been an old facility converted to diesel locomotive operation or if it were a new facility. The reason for bringing this out is that in many instances where the old facility was used the turntable was necessary but it is the trend throughout the country to favor the run through type shop in building a new facility, eliminating the turntable. The point of the turntable could become controversial as some maintenance points and some railroads do not keep their locomotives permanently coupled, therefore, this is a point for consideration by the railroads involved as to the need of the maintenance point for a turntable.

It is imperative to properly maintain and do a quick job of turning locomotives that the raised platform, depressed pit type shop be used, for this type platform and it enables the workmen to enter in and out of the locomotive, and get underneath and do a better job by making it easier for them to get to the work in a quicker manner.

It is believed even with a small shop such as we are discussing that the often forgotten item of the overhead crane with adequate capacity is needed. No longer do most railroads pull pistons and liners one at a time. It has been found that it is a quicker operation to lift the roof of the locomotive to better enable lifting the pistons and liners out as complete assemblies in engine sets. It also helps in getting to the other parts of the locomotive. Cranes are an essential part of our diesel locomotive maintenance in every respect, from the small jib crane on the wall to the capacity needed in the large overhead type for the particular shop.

A small machine shop should be maintained as there is a certain amount of machine work that will have to be done even at a small maintenance point.

Another item that is often left in the background is the space allotted to the filling of fire extinguishers. This is too important an item not to be planned for, and when we are planning our shops, even the smallest one should have the proper facility to fill and test the fire extinguishers in the prescribed manner.

Lubricating oil, at a small point, can be handled in drums, but it is economically wise and definitely better to have large supply tanks as well as the tank for used oil. The oil from the new oil tank and the oil that is to go to the used oil tank should be available right at the pit to the locomotive for this saves a considerable amount of time in filling the engine with lube oil as well as removing the used oil from the locomotive. The pumping to and from of the lubricating oil from tanks to the locomotives makes a much cleaner shop as well as saving time and the assurance in your mind that the oil is not as likely to become contaminated. If it should be found that drums are the best answer to the lubricating oil supply problem at a maintenance shop, we should make up small trucks with pumps attached to the truck that can be easily maneuvered and handle enough oil on one truck to supply an engine.

Filter cleaning is a vital part of our diesel operation and the allowance for space as well as for the new filter cleaning equipment should be made when we are planning ahead for our shop facilities.

It can be assumed that the testing of lubricating oil is necessary for diesel operation. If it should be felt there is a need at a small maintenance point for lubricating oil testing, the proper space and instruments should be set up, for to successfully operate diesel locomotives we know that the knowledge of the condition of the lubricating oil is important.

Tools for the maintenance of diesel locomotives are an expensive item, but they are definitely needed if time is to be considered, and in many instances it takes one special tool to perform a certain job; therefore, much consideration should be given to a tool room and to having the proper tool when it is needed, as well as to keeping the tool in its proper place. Even at a small maintenance point tools could become costly if not properly maintained and accounted for.

Climatic conditions for the shop should be kept in mind for heating and cooling facilities are difficult and not nearly as efficient if we do not plan and build them into our shops when the facilities are being built.

A drop pit for dropping a single traction motor is needed at the smaller shop, and if circumstances warrant, a table large enough to drop an entire truck. This is an advantage to the maintenance point in that the placing of spare trucks enables a much quicker change.

In the category of the larger running repair shop the same facilities as were listed in the smaller shop, such as depressed pits, fueling, sanding, cleaning, fire extinguisher filling equipment, etc., are needed on a much larger scale. The size, of course, depends upon the number of locomotives to be maintained.

The sanding equipment as generally used in the larger shop is piped overhead from the sand drying furnaces to tanks where the dry sand is available. The cranes in the larger shop should be of sufficient capacity to lift a

REPLIES TO QUESTIONNAIRE ON DIESEL SHOP AND TERMINAL FACILITIES

	Group A		Group B		Group C		Group D		Group E		Group F	
Number of railroads	13		12		12		11		10		8	
Million manhours or more per year average	50		20 to 50		8 to 20		3 to 8		1 to 3		1	
No. of Diesel Units Operated—Freight	3666	282	1139	95	765	63	175	16	64	6.4	12	1.5
Passenger	1037	80	412	34	109	7	36	3	...	...	...	...
Road Service	891	68	955	79	184	15	152	14	116	11.6	35	4.3
Switcher	2822	217	1069	89	672	56	144	13	54	5.4	34	4.3
No. of steam locomotives operated	9940	764	1315	109	465	39	225	20	62	6.2	2	...
Total	18356	1412	4890	407	2195	181	732	66	296	30	83	10
No. of heavy repair shops on railroad	25	2	20	2	14	1	13	1	9	1	8	0
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
1. Rewind traction motors and generators	10	3	4	8	2	10	0	11	0	10	0	8
2. Repair injectors	12	1	7	5	3	7	2	9	3	7	5	3
3. Reclaim liners	10	3	8	4	7	5	9	2	2	8	3	5
By replating	4	6	5	3	2	5	3	6	2	0	3	0
By reboring	10	0	5	3	3	4	6	3	0	2	0	3
4. Are any diesel parts lubrized?	5	8	4	8	3	9	1	10	1	9	1	7
5. Reclaim heads and liners to new style by welding	6	7	3	9	5	7	0	11	2	8	0	8
6. Reclaim aluminum pistons	8	5	7	5	9	3	4	7	4	6	1	7
7. Repair governors	9	4	10	2	4	8	4	7	5	5	5	3
8. Repair four cycle injector pumps	10	3	8	4	4	8	1	10	2	8	5	3
9. Repair radiators	10	3	9	3	6	6	4	7	7	3	5	3
10. Repair damaged A-frames	12	1	10	2	5	7	2	9	1	9	5	3
11. Grind own crankshafts	1	12	11	1	1	11	0	11	1	9	0	8
12. Load test overhauled engines:												
In locomotives	12	1	12	0	11	1	8	3	7	3	5	3
With portable plant	7	6	8	4	6	6	3	8	2	8	0	8
With stationary plant	7	6	5	7	3	9	1	10	3	7	3	5
13. What facilities for detecting cracks:												
Magnaflux	13	0	12	0	10	2	10	1	6	4	3	5
Magnaglo	12	1	10	2	8	4	4	7	0	10	0	8
Zyglow	8	5	6	6	6	6	3	8	0	10	0	8
14. Is centrifuge filter cleaning machine used?	11	2	9	3	8	4	5	6	2	8	3	5
15. Is lube oil piped to points of use?	12	1	10	2	11	1	7	4	1	9	1	7
16. Is drain oil stored for reclaiming?	13	0	12	0	9	3	7	4	2	8	0	8
17. Is lube oil reclaimed?	12	1	12	0	8	4	3	8	1	9	0	8
If yes, on the railroad property	10	2	9	3	4	4	3	0	0	1		
to an outside concern	6	6	5	7	4	4	0	3	1	0		
Is detergent replaced?	7	5	10	2	6	2	3	0	0	1		
18. Do you dry sand at each location?	9	4	9	3	9	3	6	5	7	3	4	4
If no, do you dry sand at central location?	2	2	3	0	2	1	1	4	2	1	4	4
Purchase pre-dried sand?	5	8	0	12	2	10	3	8	1	9	0	8
19. Do you have depressed floor in main shops	5	8	5	7	8	4	4	7	4	6	3	5
In running repair shops?	11	2	9	3	4	8	5	6	4	6	4	4
20. Are trucks removed by drop pits?	10	3	8	4	6	6	5	6	2	8	2	6
By transfer table?	8	5	5	7	3	9	2	9	0	10	1	7
By cranes?	10	3	7	5	7	5	4	7	4	6	0	8
By electric jacks	9	4	7	5	3	9	3	8	3	7	5	3
21. Are automatic brush type washers used for cleaning road locomotives?	8	5	6	6	3	9	0	11	0	10	0	8
22. Exhaust ventilating system in running repair shops?	11	2	9	3	8	4	9	2	5	5	5	3
23. Are mobile refueling and sanding units used for large terminals and yards?	6	7	1	11	2	10	0	11	0	10	0	8
24. How many days fuel supply are stored and is it considered adequate?	30		26		35		30		45		50	
	7	6	9	3	7	5	7	4	8	2	8	0
25. Are heavy repair shops—New		2	3 N&C	1		1		4		2		2
Converted	11		8		11		7		8		5	
26. Do you have portable, stationary, or both type platforms in running repair shops? Portable		1		2		4		2		3		2
Stationary		6		6		4		5		6		4
Both		6		4		4		4		1		1

diesel engine, main generator, etc., for the trend is to have the large maintenance point change engines and main generators.

The drop tables are of utmost importance in the large repair shop. Many railroads are changing out complete trucks rather than individual motors, and this gives a much quicker change of traction motors.

There should also be much thought given to the checking of parts that are removed, either by the use of Magnaflux equipment or by the Dy-Chek method. These two methods tell the condition of the part to be put back in service. The large maintenance points take care of their own parts removed and applied by these methods.

Painting facilities are needed at the heavy maintenance points and should be prepared for by having the proper paint shop. This shop should have scaffolds that can be adjusted to the proper height to provide for accessibility. The locomotive paint shop deserves much consideration in shop planning for the future, as a paint shop is necessary to properly paint locomotives.

Material is an item of much consequence, and frequently overlooked until we get into a shop, but we should make out plans to have space allocated for the storage of such every-day items as needed in maintenance, and by the same token, place a person in charge of replenishing the supply of material right in the shop where it is to be used. This eliminates the practice of many people going to and from the storehouse, and at the same time gives ready access of material to the mechanics.

It would be well to have a place planned and designated for worked-up material to be placed at the disposal of the mechanics. By this we mean pistons ready for service. connecting rods, auxiliary generators, and other items available right in the shop where locomotives are maintained. Items as this certainly will reduce out-of-service time, and can be prepared for if these plans are put into effect when shops are built.

At this point we would like to bring out that some railroads have centralized points on their system where all parts are checked, cleaned, and repaired, and then shipped to the outlying maintenance points for use. We have in mind cylinder heads, pistons, connecting rods. lube and fuel oil pumps, engines, traction motors, and other such items. The facilities for these shall be discussed in our third item of shops necessary for the maintenance of diesel locomotives. This is brought out at this time to clarify the point that if this system is to be used, some of the machines and facilities for the larger maintenance shop should be changed.

The third shop of which we speak is the heavy repair or classified overhaul point where engines, traction motors, main generators, and other such items are rebuilt. Most railroads have set up a large shop to either handle the entire needs of the railroad, or placed more than one such shop on the system if the need for more than one heavy repair shop is necessary.

Before we go into different shops and facilities needed for heavy work, much thought will have been given to the extent of repairs and reclamation that is to be made by the particular railroad involved. Some railroads do not feel it wise to go into the heavy repair of parts, such as rewinding armatures, main generators, or the complete reworking of Diesel engines, such as line-boring, etc. Other railroads, and believed to be the majority as indicated by questionnaires, are performing their heavy repair work, as well as the reclamation of many parts. Either way the railroad should decide on the repairing of parts as this will make a difference in the shop facilities.

In the erecting shop for diesel locomotives it is well to again have sufficient cranes for the handling of the diesel engines and other parts. Some shops use the method of lifting the locomotive and rolling the trucks out, while other railroads use the drop pit for removing trucks, then place the locomotive on dollies for the movement around the shops.

The erecting shop is the center of much activity in that the removal and application of parts is the start and finish of the entire heavy overhaul work. From the erecting shop the engines are taken to other shops or bays; main generators to other shops or bays; traction motors, etc., are taken to their own particular place to be worked.

As stated above, the erecting shop is like the hub of the wheel in that the parts are going from and coming back to this shop.

In the shop for building of engines, Magnaflux or Dy-Chek equipment is needed for the engine parts. Many job cranes are necessary for the handling of the smaller parts. Smaller bays for shops are set off from the engine shop to repair the water pumps, lube oil pumps, governors, blowers, etc., prior to their being assembled in the diesel engine.

In the armature shop, with its necessary planning, machines, ovens, banding machines, spraying machines, high frequency soldering machines or soldering pots, are placed in locations where each movement of the armature will be in that one direction of final overhaul.

The traction motor assembly and field frame shops are frequently in the same building with the traction motor armature shop, which is well, because the work is so closely associated, but, if an older shop which has been changed from steam to diesel work is used, sometimes the two are separated, which depends upon conditions of the shops involved, and would greatly affect the repairs of traction motors.

If the building so warrants that all the electrical repair assemblies, such as main generators, traction motors, auxiliary generators, etc., are in one shop, this is an advantage. If not possible, facilities and shops for each individual item such as main generators and auxiliary generators can be separated rather than be mixed up with other parts to be repaired that are not related.

To this heavy repair shop most assemblies for other parts of the railroad are shipped for repairs; therefore, it is well to have the tools for the testing of each assembly as close as possible, so as to have assurance that the part is in working order when shipped to outlying points. This is a very important operation in a large overhaul shop and is worth while considering for space when planning the diesel shop.

Many railroads have gone into reclamation on a full scale, for money can be saved in the reclamation program. This program is to the extent that a shop properly equipped with tools, such as the latest welding equipment for aluminum welding and other type welding is necessary. Magnaflux equipment or Dy-Chek system is needed in this shop, and testing equipment is almost an absolute necessity to make sure that the job of reclaiming parts has been performed in a complete manner to insure a good used part.

Results of Questionnaire to Railroads

The accompanying tabulation represents the average results of a questionnaire sent to 66 railroads. The results are grouped in the same arrangement as statistics furnished by safety section of A.A.R., namely, on a million man-hour basis. This was done to bring out opinions from various sized railroads as to how they are handling the problem of diesel facilities.

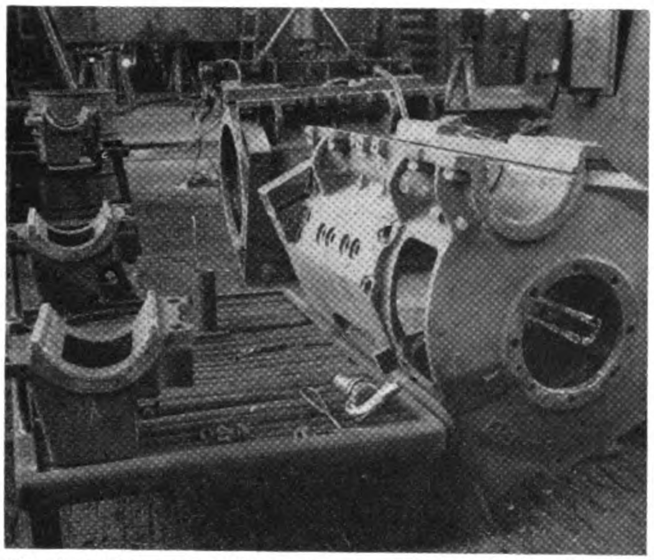


Fig. 1—Surfaces are built up in a sequence to limit temperature rise to 300 deg.

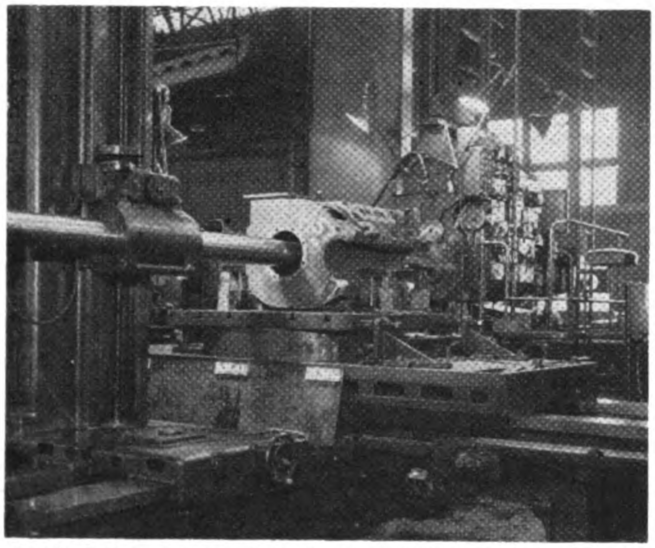


Fig. 2—Built-up housing ready for the machining done on the first set-up.

Reconditioning Traction Motor Housings

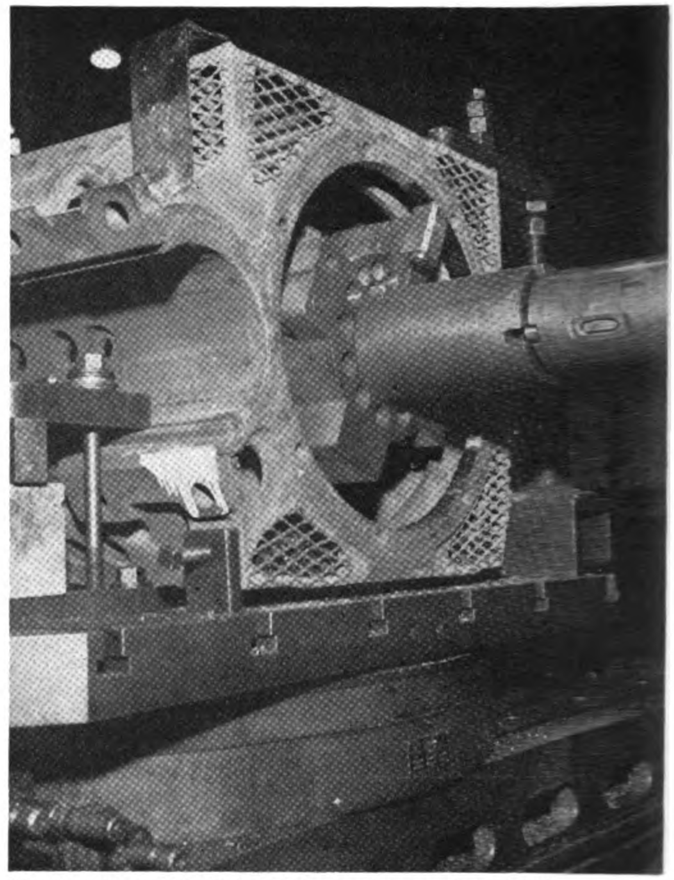


Fig. 3—Spider which holds either a boring or a facing tool.

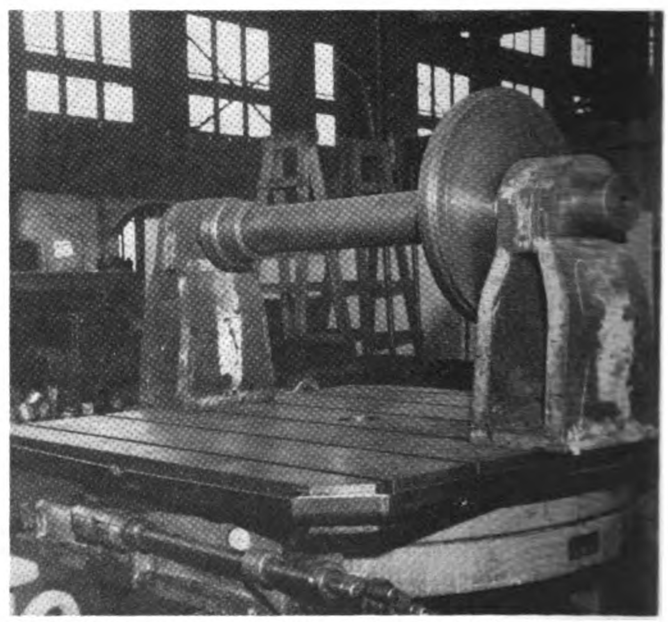


Fig. 4—Pinion mandrel end of jig which automatically aligns surfaces bored in set-up No. 1.

TRACTION motor housings are reconditioned completely by the Louisville and Nashville at the South Louisville Shops. The first step in the procedure is to dismantle the housing to remove all electrical equipment, including both commutator and pinion end head, leaving only the

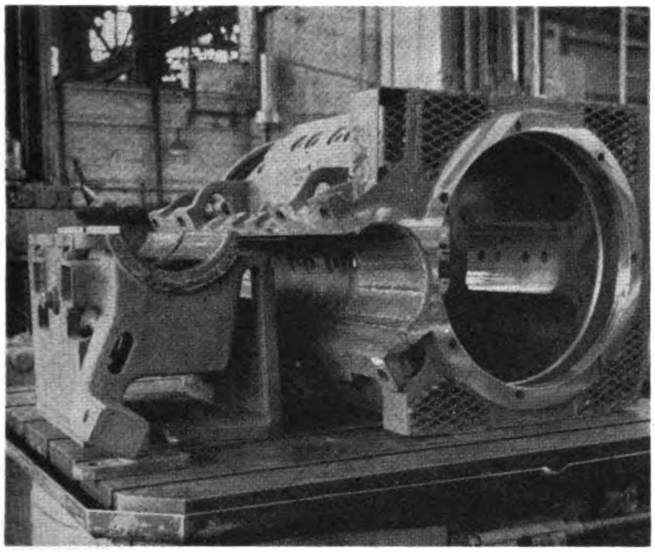


Fig. 5—Frame after completing operations in set-up 1 and ready for those in set-up No. 2.

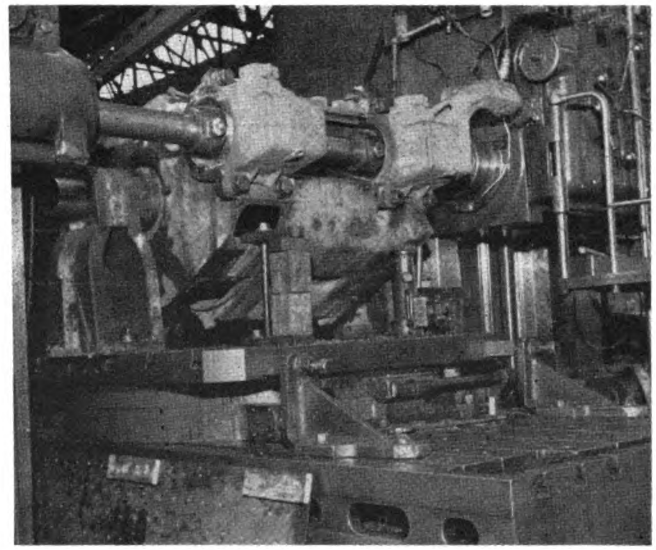


Fig. 6—The final reconditioning operation is boring the axle support bearings.

housing and the suspension bearing caps to be sent to the welding area. All wearing surfaces are built up, including all bores, the lateral bearing surfaces of the housing, and the suspension bearing cap.

The welding is done at one location using 1/8-in. E-6012 electrodes with straight polarity d.c. current. Comparatively small sections of each surface are done at a time, with each succeeding section staggered (Fig. 1) so that the temperature rise does not exceed 250 to 300 degrees. The welder skips from one surface to another after making one or two passes and checking the heat rise by feel to keep the temperature below that which may cause distortion.

After the application of each pass, the weld is peened thoroughly. The housings are given stress relief at 1,200 to 1,250 degrees for three hours. The cooling down to 500 degrees is done in a closed furnace with a minimum elapsed cooling time between 3½ to 4 hours. Normally the schedule is set up so that the housings are heat treated during the afternoon and allowed to cool down over night.

Heat Treating Operations

When heat treating operations are completed the housing is moved to the machine shop where all surfaces are restored to standard dimensions in two setups on a Giddings and Lewis No. 560-T milling, drilling, and boring machine. A dial indicator is used to establish the center line.

For the first operations, the housing is positioned on a 5-ft. rotary table and the center line established (Fig. 2) by locating three of the four field coil pads true with the machine spindle. The pad nearest the axle bearing generally varies slightly from the true diameter as a result of welding in the axle bearing and thin wall section at that point; however, the maximum increase experienced, to restore the pads to true diameter due to this distortion, has not exceeded 1/32 in. on any of the 45 housings worked to date.

After the coil pads have been rebored, the commutator end of the housing is bored and faced to drawing dimension by use of the boring head shown in Fig. 3, the pinion end being machined in like manner by use of the same head.

The accuracy with which the second set-up is made determines the overall effectiveness of the rebuilding job. The housing is mounted in a jig (Fig. 4) designed properly to align the established center line, developed in the first operation, with the machine spindle. This jig is simple in construction and has three parts consisting of two identical mandrel supports and a 5¼-in. diameter mandrel. Both mandrel supports are line bored and have keys on their base to suit the tee slots in the rotary table; the mandrel is equipped with a fixed and a movable head tapered to center in the finish bores of the housing, the whole assembly being secured by a nut behind the movable head.

Boring Axle Bearings

With the mandrel in place on the rotary table and the housing secured, the axle bearing is positioned to allow the seats to be milled to fit the axle bearing caps which have been machined on other equipment. With the bearing caps fitted, a .018-in. shim is inserted between the cap and the housing and the caps are then bolted in position.

The final and most important operation is the boring of the axle bearings (Fig. 6). The table is indexed 90 degrees and the boring bar put in position. An accurate check is made to establish the exact drawing dimension between the housing bore center and the axle bore to assure proper meshing of the motor and axle gears. An interesting method is used by the L. & N., although several methods are satisfactory. A predetermined diameter has been turned on the fixed head of the mandrel which fits the pinion end bore of the housing and the spindle diameter of the machine. The two dimensions are added together, divided by two and the result subtracted from the gear center dimension shown on the drawing. A round gage was machined to this decimal diameter and when properly used, gives accurate and dependable results. Line boring and facing of bearings and caps completes the repair.

After the motor has been reassembled, the .018-in shims are removed and .012-in. shims are used to provide the draw required when the bearing shells are installed.

ELECTRICAL SECTION

How Batteries Are Maintained at Grand Central Terminal

Batteries are changed and trucks kept in continuous service. Size of installation justifies making on-the-spot repairs

GRAND CENTRAL TERMINAL in New York City operates more than 100 battery-powered trucks to handle mail and baggage for the New York Central and the New Haven. Trucks operate 24 hours a day, seven days a week. During normal operations, 25 trucks are required to handle mail alone. On week ends, as many as 44 trucks are required just to handle newspapers. In peak periods—during Christmas, for example, and on heavy-travel holidays—each truck carries increased loads and works every minute of the shift.

To keep these trucks on the move at all times and prevent work stoppages, Grand Central Terminal follows carefully planned maintenance schedules.

Because of the large number of trucks, battery changing is staggered. No more than two trucks are at the battery room at a time. Each truck has its battery changed every other day, changes being scheduled over the three shifts.

An unusual lifting device, Fig. 1, has been fashioned to effect quick changes in baggage-carriers, the compartments of which so limit the size of batteries that they cannot be equipped with lifting lugs or handles. In some carriers, the batteries must be removed through the ends

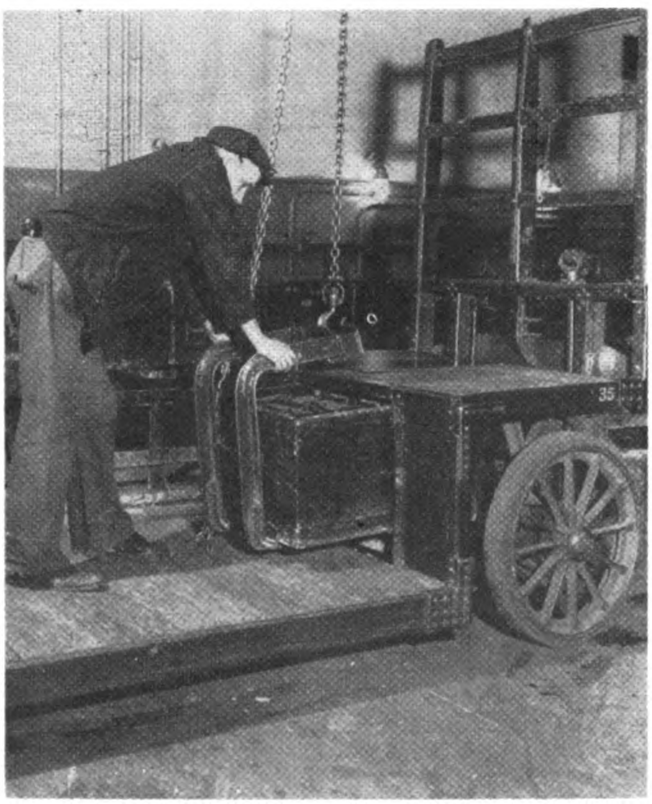


Fig. 1—With the lifting device shown above, baggage-carrier batteries are changed-out in three minutes average time. The lifting yoke, engaged at the top by a hoist hook, lifts the batteries into their compartments with a minimum of manual handling

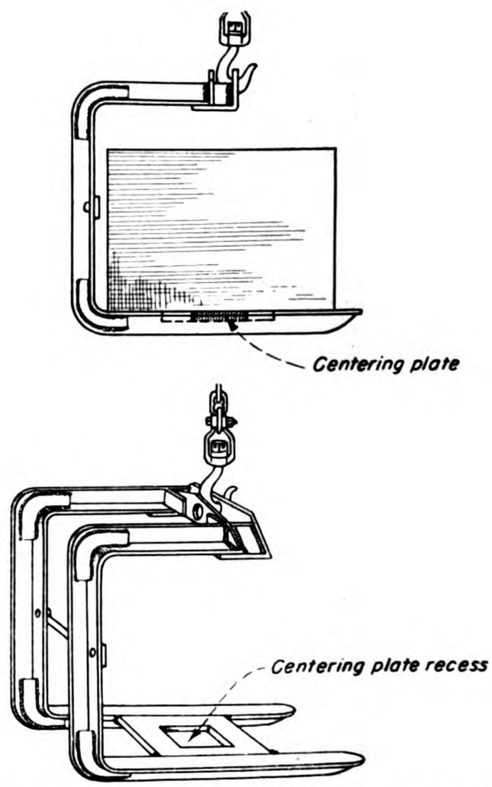


Fig. 2—Details of lifting hook construction showing how the battery rides on the hook. The centering plate recess is a hole in a strip of metal between the prongs of the hook. The centering plate, attached to the bottom of the battery, fits into the recess and keeps the battery in place on the hook

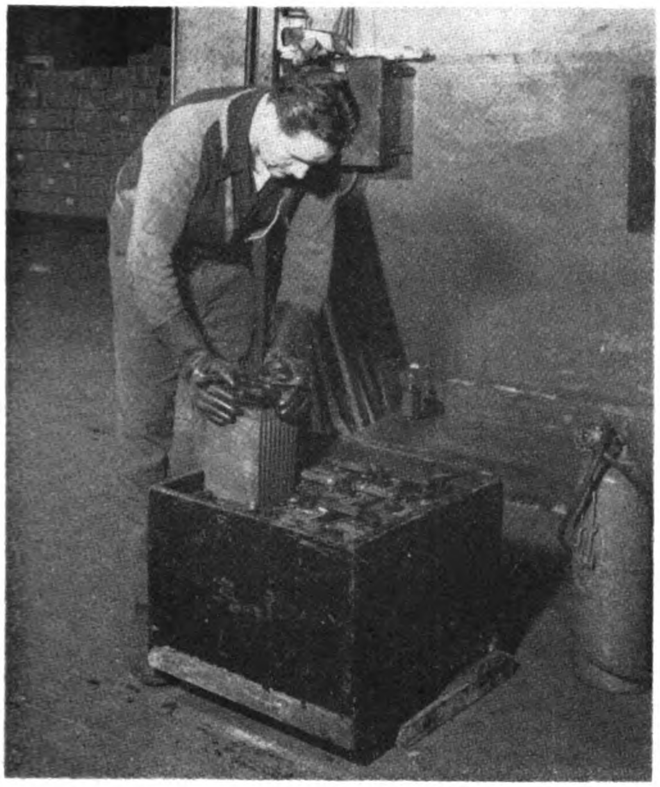


Fig. 3—An area in the battery room is reserved for such repairs as broken covers and broken posts. Carefully kept records help the Terminal to extend the life of its batteries and aids it in selecting replacement batteries

of the compartments because the compartment-tops do not open. Average time for changing batteries in any baggage-carrier is three minutes.

The pick-up element of the lifting device is a large lifting yoke, the top of which is engaged by the hook from an overhead hoist mounted on a monorail. When removing a battery from its compartment in a baggage carrier, the bottom of the yoke is slid into the compartment under the battery. A rectangular centering plate, approximately 5 in. by 8 in. by 1 in., fits into a recess in a plate on the yoke when the yoke is in the proper lifting position (see diagram). After positioning the yoke, the attendant lifts the battery slightly with the hoist, moves it horizontally out of the compartment, then carries it to the racks. Although the battery, riding the yoke parallel to the floor, appears to be in a precarious position, there is no danger of its being knocked from the yoke because the centering plate in its recess acts as a safety device to prevent the battery from shifting position and tipping the yoke.

When a battery is put on charge, records are taken as to which truck the battery was taken from, time placed on charge, voltage reading, specific gravity, and temperature. Similar data is recorded when the battery is taken off charge and put in another truck. There records enable maintenance men to tell whether a battery is being charged correctly, used properly in service, or nearing the end of its life. They enable corrective measures to be taken before battery damage or truck down-time due to battery failure occurs.

Batteries are given equalizing charges periodically to keep all cells in fully charged condition. Cells deviate in normal operation due to a number of factors which effect each cell differently—addition of water, temperature, differences of cell location within the tray, etc. When giving an equalizing charge, the battery is charged at the finishing rate, pilot-cell specific gravity readings being taken hourly until four successive equal readings are obtained. Then specific gravity readings are taken of all cells, and if any is abnormally low, an investigation is made to determine the cause.

In this connection, the battery room is equipped with a repair area (Fig. 2), so that repairs can be made on location. Such defects as damaged jars, broken covers, broken posts, etc., are repaired in this shop. The terminal maintains 225 batteries; it is this large number which justifies the on-the-spot repair shop.

Discharge tests are given the batteries periodically to determine battery condition. In making this test, fully charged batteries are discharged at the six-hour rate to a voltage of 1.75 volts per cell. Voltage readings are

Fig. 4—Typical example of the severe demands on its 100 battery-powered trucks illustrates why well scheduled maintenance is particularly important at Grand Central. The terminal maintains 225 batteries in its baggage and mail operation

recorded throughout discharge and if 80 per cent or more of the rated capacity is obtained, the battery is returned to service. If, however, the battery is not within this range, the cause is determined and the battery is repaired or a replacement battery ordered.

In addition to everyday records, equalizing charge records, and discharge test records, master records are kept for each battery. These master records indicate the battery serial number, make, number of cells, ampere-hours capacity, and service location. A monthly record is kept on each battery indicating when the battery went into service, when major repairs were required, and when the battery was replaced. This record is useful when selecting replacement batteries.

All in all, this battery room is an exceptional example of good maintenance. The severe demands of the trucks (Fig. 4), particularly during peak periods, make this well scheduled system imperative. Not only does the system pay off in efficient truck operation, but it also results in long battery life. Proper battery care is doubly important today because the shortage of materials puts the metals from which they are made in the short supply category and demands the maximum kilowatt of every battery now in service.

D. & R. G. W. Relights Its Ticket Office

THE Denver & Rio Grande Western decided to relight its city ticket office at Denver, Colo., to create a more pleasing appearance. Smithcraft Mercury fixtures were selected for their high efficiency and attractive styling. The lighting intensity had been on the order of 15 to 18 foot-candles throughout the area open to the ticket buying public. Artists' perspective sketches were prepared of the various possible layouts, and the final arrangement of fixtures was selected from these drawings.

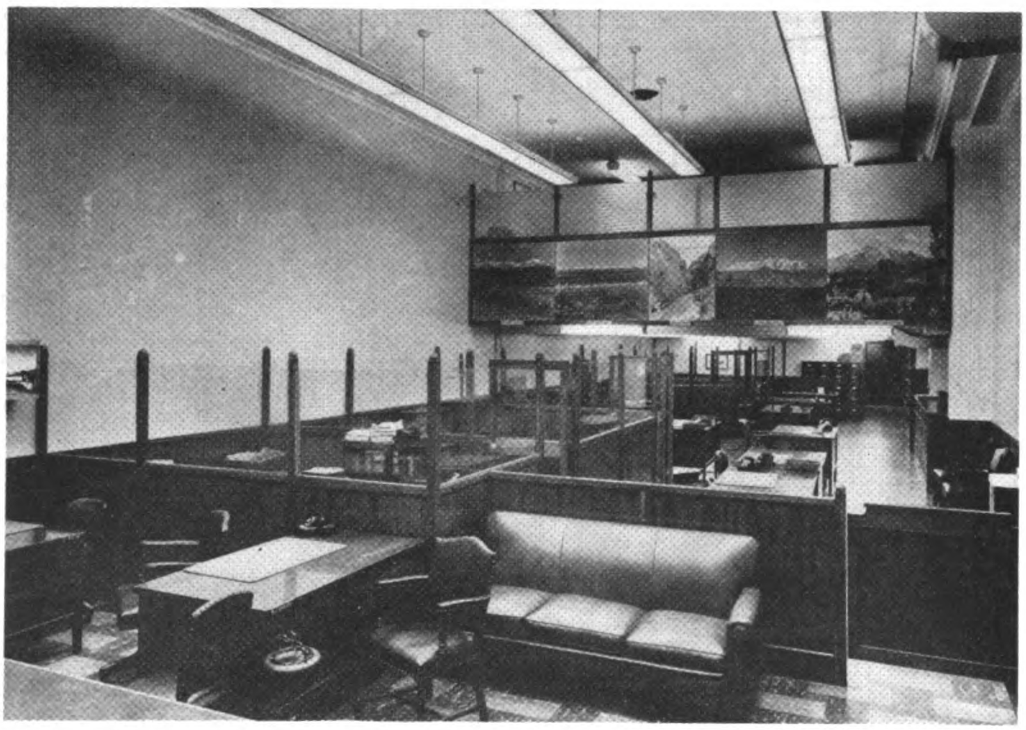
The fixtures installed have three 96T12 slimline lamps each, rated 72 watts per lamp, for a total of 3 watts per square foot. The resultant foot-candles after 100 hours of service were from 60 to 70, somewhat exceeding the calculated value and adequately fulfilling the requirement of presenting a very attractive ticket office to the eyes of the public.

A trial installation was made of low-voltage control of the lights, with a view toward evaluating the possibilities of this type control in future yard office construction. The equipment used was General Electric and consisted of three type RSS-1 switches, three type RR-2 relays and one RT-1 transformer. Switches were mounted on a column with low voltage SI 53083 remote control wire running to the 24-volt relays. Each relay controls one row of lights.

After five months of operation, the system has proved highly successful and indicates great reliability, in addition to ease of initial installation. Long switch-leg runs in conduit are entirely eliminated.

At the same time, the ticket office was relighted, three advertising display windows were likewise fitted with 96T12 slimline lamps. Ten lamps were installed in each window, giving 100 foot-candles on each display.

The lobby lighting in the building, indirect and concealed in a cove, was also replaced with the T12 slimline lamps, with special reflectors manufactured in the D. & R. G. W. Burnham sheet metal shops. These reflectors were rolled and formed to fit into the existing plaster cove. The slimline lamps give a soft diffused light throughout the entire lobby, and raised the illumination level to 12 to 14 foot-candles.



The lighting units which are inconspicuous provide a bright and pleasantly-lighted interior

Flashovers—Causes and Remedies

A candid statement of what is known about diesel locomotive motor and generator flashovers and some suggestions for keeping them under control

SOME very frank talk on the general subject of locomotive generator and motor flashovers is included in a report presented by the Diesel Electrical Committee at the meeting of the Locomotive Maintenanc Officers Association, held in Chicago, September 15-17.

Concerning the available information on flashovers, the report offers the following:

Since about 1860, when the Englishman, Michael Faraday, discovered that electricity could be made man's servant, electric motors and dynamos have gradually and increasingly come into common use, and along with them the plague of flashovers.

Actually, less information has been accumulated on the subject of flashovers than the cause of aurora borealis and australis. Whereas, it is known that the magnetic needle is disturbed during the presence of a magnetic storm and that magnetic storms and sun spots occur simultaneously flashovers occur under any and all conditions. Theoretically, flashovers should not occur and no doubt, due to this fact, very little has been written on the subject.

Diesel locomotive propulsion generators and traction motors are, without a doubt, required to perform over a wider range of conditions than any other common electrical application, which no doubt contributes to the frequency of these undesired occurrences.

Only recently has extensive study on this subject been initiated. Tests are being made by causing flashovers on a direct current generator and readings of involved forces are being recorded. Technical information on these tests is not yet available but, will be soon.

Fundamentally, most flashovers originate as a leakage of current between brush holders of opposite polarities. This leakage may develop gradually as in the case of faulty commutation where fire stringers form and build up between brush holders, or it may occur suddenly as in the case of a heavy field distortion, which might result from either short circuit or sudden unloading. Porcelain insulators are shattered at times along with untold other electrical damage, and usually the power plant is rendered inoperative by the ground relay tripping.

Data on nineteen actual flashovers which occurred on diesel locomotives while in road service is enlightening from all standpoints except, unfortunately, the actual cause. The average tonnage of trains being drawn when flashovers occurred was 2,803; the least being 650, and the most being 4,750. The average speed was 32 m.p.h. with a low of 12 and a high of 55. Four cases happened on very heavy pull, one at high speed and the remainder average. Only one case occurred when wheels were spinning and likewise only one at time of transition. One reportedly happened when the throttle was being shut off for a railroad intersection, and none actually occurred while crossing rail intersections. One-third more flashovers occurred while locomotives were being operated in manual transition than in automatic. In all but three cases, brush tension and brush box clearance was correct. In eleven cases, generators were clean; four fairly clean and four were dirty. Most cases occurred while operating in the eighth position of the throttle and all transition positions were evenly involved. None happened on slippery rails. Different engineers were handling the throttle in every case, and one of the 19 cases happened on the same locomotive. In only one case, had the ground relay tripped prior to the flashover. All locomotives except one were of the same manufacture and two models were involved. After flashovers occurred, the resistance of insulation between high voltage circuit and locomotive ground was in three cases zero, in five cases between 150,000 ohms and one megohm and in eleven cases above one megohm. The maximum engine speed in all cases, except one, was normal or below normal, the one exception being but 10 r.p.m. high. In six cases, flashover damage was found in the traction motors also.

Suggestions for reducing occurrences of flashovers are summed up as follows:

From current available information, it would seem that in order to hold flashovers to a minimum, that the following precautions should be observed:

1. Keep commutators smooth, corners rounded and free of sharp points.
2. Keep spaces between commutator segments free of carbon and dirt.
3. Keep string bands and porcelains immaculately clean.
4. Keep brush tension consistent and as recommended by manufacturer.
5. Keep control apparatus in good repair and properly adjusted.
6. Keep enginemen informed as to proper method of handling throttle.

It is known from experience that the sudden unloading of a heavily loaded generator will create a flashover. It is also known that the abnormally high voltage which will result from delayed forward transition is conductive to flashover.

At preesnt, there are as many theories regarding flashovers as there are of the origin of the flying saucer, but it is hoped and believed that, with the present aggressive form of research work being carried on in this particular field, that we will soon be much wiser and more capable of preventing the serious electrical damage and resulting delays caused by these localized bolts of lightning.

Listed in the following are some of the detailed specific causes which the committee considers worthy of consideration:

Machine Interior Susceptibility Factors

1. Flashovers may be caused by carbon, dust and oil vapors in the main generator. A high degree of cleanliness is required. There is a relation of megger readings to flashover susceptibility. Possible alterations may be made to give better control of contaminants such as filtering the generator air, redesign of the air compressor discharge piping system, and isolation of the generator from the engine room.

2. Traction motor string band cleanliness. Is cleanliness of motor more important than main generator?

3. Effects of various cleaning materials. It has been noted that main generators have flashed over more severely after cleaning than before, if a strong solvent wash is used.

4. Necessity of rounding ends of commutator bars, particularly after turning.

5. Importance of brushholder clearance to commutator and position of brushes with respect to neutral.

6. Condition of brushholder porcelains.

7. Condition of string bands.

8. Commutator surface condition.

9. Brush conditions.

10. Main generator and traction motor design features to minimize field distortion with sudden armature current change.

Voltage or Current Surge Producers (External to Machine)

Surges resulting in flashovers may result from any of the following sources:

1. Throttle handling.

2. Reversing.

3. Operation in manual transition at speeds above or below proper changeover speed.

4. Prolonged operation at speeds close to or exceeding designed maximum locomotive speed.

5. Improper timing of relays and contactors during transition sequence.

6. Improper automatic transition settings. There is need of spread between pick up and drop out settings.

7. High rate of generator field decay rate during transition. Effect of defective field discharge resistor and relation of resistor value to field decay rate.

8. Automatic transition design features.

9. Insufficiently sensitive ground relay. Will a faster acting ground relay reduce the extent of flashover damage?

10. Is it known that most flashovers occur during wheel slip? How much wheel slip?

11. Unloading and loading the generator. What is the proper way to unload and reload the equipment when wheels slip so as to minimize chance of wheels slipping again? Of what importance is load regulator timing.

12. Diesel engine overspeed and load control settings being set for too high.

13. Interlock and contact difficulties which might cause main or field circuit to make and break while under full load. Particular points of trouble such as battery field contactor interlocks, wheel slip relay contacts, ground relay contacts, motor shunting contactor interlocks and control jumper receptacles.

14. Proximity of main contactor breaking arcs to cabinet doors or other structural members. Effectiveness of arc blowout features.

The report was prepared by a committee of 16, and presented by Committee Chairman W. P. Miller, assistant to chief mechanical officer, Chicago & North Western.

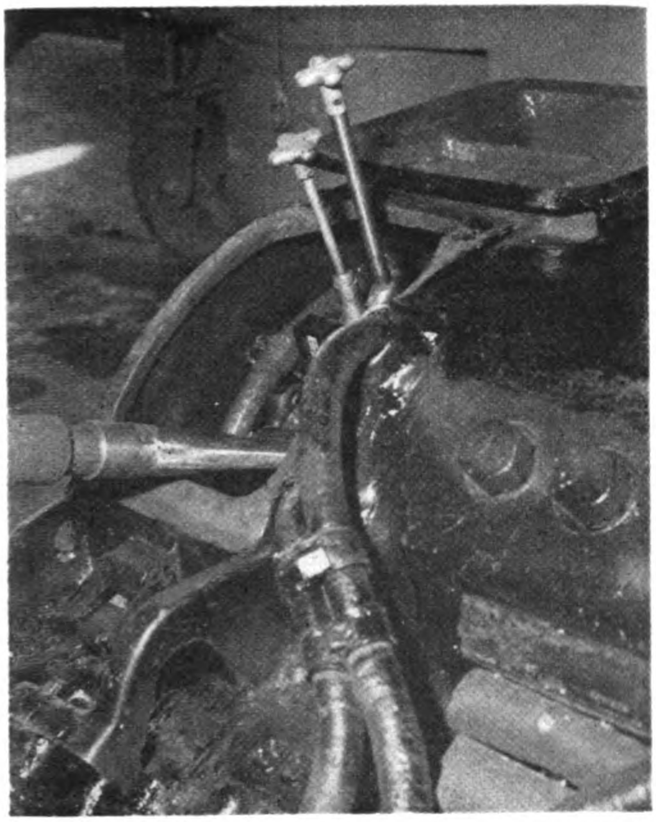
Metalized Motor Shafts Last Longer

The Atchison, Topeka & Santa Fe has since 1950 been using metal spray for restoring the bearing fits of traction motor shafts and also for building up the bore of bearing housings.

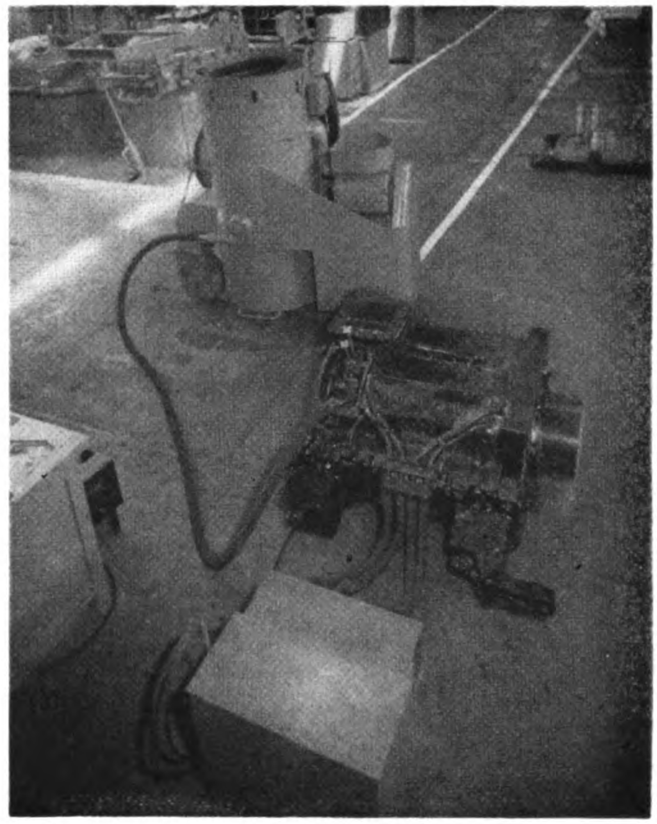
In 1949, 18 per cent of the motors coming into the railroad's shop at San Bernardino, Cal., for periodic overhaul required new shafts because of wear at the inner race fit. In 1950, metallizing of bearing fits was started and in that year, only 11 per cent of the overhauled motors required new shafts. During 1951, the number of motors needing new or reclaimed shafts was reduced to 6 per cent.

The surface of the shaft or the bearing housing fit to be metallized is prepared by grinding, great care being taken to keep the ground surfaces free of oil or even finger marks before the metal is applied. The thickness of the added metal does not exceed .006 in. or enough to increase the shaft diameter a maximum of .012 in.

Metallizing an outer bearing fit in a traction motor bearing housing



A diesel traction motor with brush cover removed and with the grinder and vacuum nozzle in place



The vacuum cleaner effectively removed all copper dust during the grinding operation

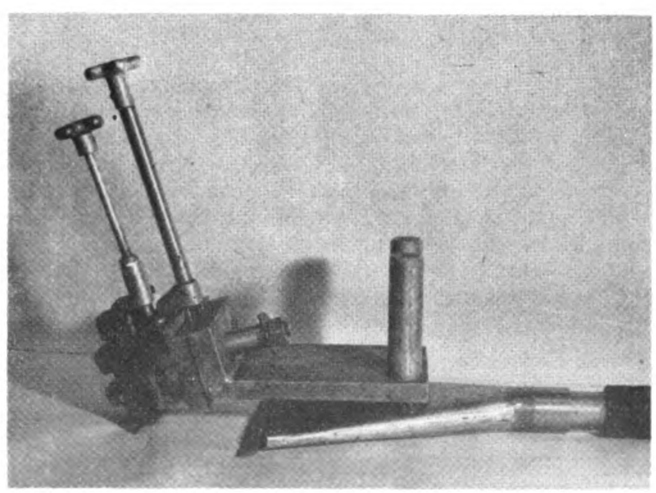
Dust-Free Commutator Grinding

Complete removal of grinding dust while grinding commutators in place is accomplished by a method developed in the Sacramento, Calif., shops of the Southern Pacific. The commutators are ground with an E.M.D. fixed-stone grinder and shop-made adapters provide for using the grinder on General Electric and Westinghouse, as well as Electro-Motive, motors and generators of all types. The grinding dust is carried away during the grinding operation by a vacuum produced by a 5-hp. Hoffco-Vac No. 50 portable cleaning unit.

For the grinding operation, the brush holders are removed from one brush stud and the grinder secured to the stud. One of the four-point handles is used to bring the stone up against the commutator and the other is used to move it back and forth across the commutator while the motor armature is driven at low speed from a low-voltage d.c. power source.

A specially shaped nozzle is placed close to, but not touching the commutator just below the grinder in the direction of travel of the armature. The nozzle is secured in this position during the grinding operation. Air is drawn into the nozzle by the vacuum cleaner. The original nozzle, shown in two of the illustrations, is made of metal and is fitted with a rubber lip to keep it from scratching the commutator. Now that the most effective nozzle contours have been established, additional nozzles will be made of plastic.

Before this method of removing grinding dust was used, various means of blowing the dust out were tried. During the course of these experiments, it was found that even four jets of air from the pinion end were ineffective in removing the copper dust. Since the vacuum nozzle has been employed, no difficulty caused by copper dust has been experienced.



The grinder and nozzle removed from the motor and placed to show their relative position during the grinding operation

DIESEL-ELECTRIC—How to Keep 'Em Rolling

13 Power Switches, Reversers, Control Switches, Controllers, Breakers and Fuses

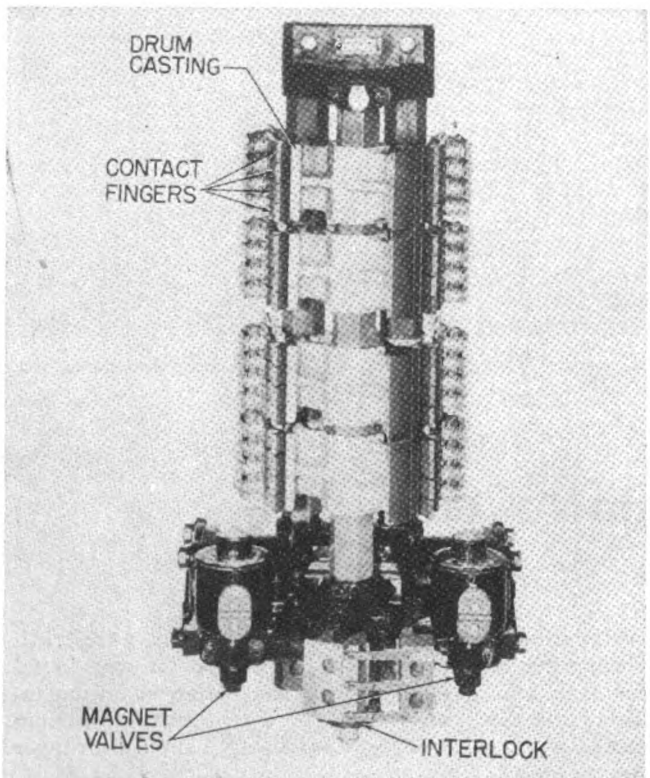


Fig. 1—A drum-type reverser used on diesel-electric locomotives

Switch is a word with all sorts of meanings. To many it recalls childhood visits to the woodshed. To a railroader it means a number of things. Perhaps the commonest is the track switch. Everyone knows how these are used to guide trains onto the right tracks. In the same way electric switches are used to put current into the right wires. They are made in many sizes, shapes and forms. We are now going to take a look at some electric switches found on locomotives.

Power Switches and Reversers

We already know that a contactor is used to open and close electric power circuits. Power switches are also used in these circuits. Such switches are the "pin boys" for the contractors. They set up the circuits before the contactors close, and rearrange them after the contactors open. But they are not used to open or close circuits in which current is flowing.

The reverser is one power switch found on all diesel-electric locomotives. When the engineer wishes to back up, he moves the reverse handle on his controller to the reverse position. This causes the reverser to throw to the reverse position and change the connections of the traction motor fields. Since the flow of current in the fields is reversed, the motors will turn in the opposite direction and the locomotive will back up. The reason for this was explained in the first article of this series.* To avoid damage, the reverser should be thrown only with the throttle off and the locomotive standing still.

Two types of power switches are found on locomotives. While they are quite different mechanically, both are used as reversers. This might seem confusing at first. However, you can easily learn to tell them apart. Because they are different, they need different care. If you learn to tell them apart and how to maintain each, you will not have any trouble.

The Drum Switch

The reverser shown in Fig. 1 is what is commonly called the drum-type switch. In the picture you see the four drum castings and eight banks of contact fingers. Each bank contains four fingers. These fingers ride on the drum castings. Now let's see how this reverser does its job.

Fig. 2a shows a traction motor armature, its field, and a reverser as they appear on a wiring diagram. To change the direction in which the motor turns, we only need to change the direction of current flow in its field. This is the reverser's job; but the wiring diagram does not show how it's done. The sketches in Fig. 2 help explain it.

Suppose you wrap a strip of paper around the two top drum castings and mark the finished metal surfaces where the fingers ride. When you remove the paper and spread it out flat you will have a pattern like that shown in Fig. 2b. Here lines have been added to show how the segments are connected together. Actually these connections are part of the drum casting. Now, if you add the rest of the electric circuit to this sketch you will have Fig. 2c. The four small shaded squares for each connection are the fingers that ride on the drum surface. The motor armature and fields are connected to these banks of fingers. Arrows show the path that the current will follow when the motor is connected to the generator.

This is the thirteenth of a series of articles on the maintenance of diesel-electric equipment. This article is written by B. L. Judy and P. W. Pelton, both of the Locomotive and Car Equipment Department, General Electric Company, Erie, Pa.

* Railway Mechanical and Electrical Engineer, July 1951, Page 72.

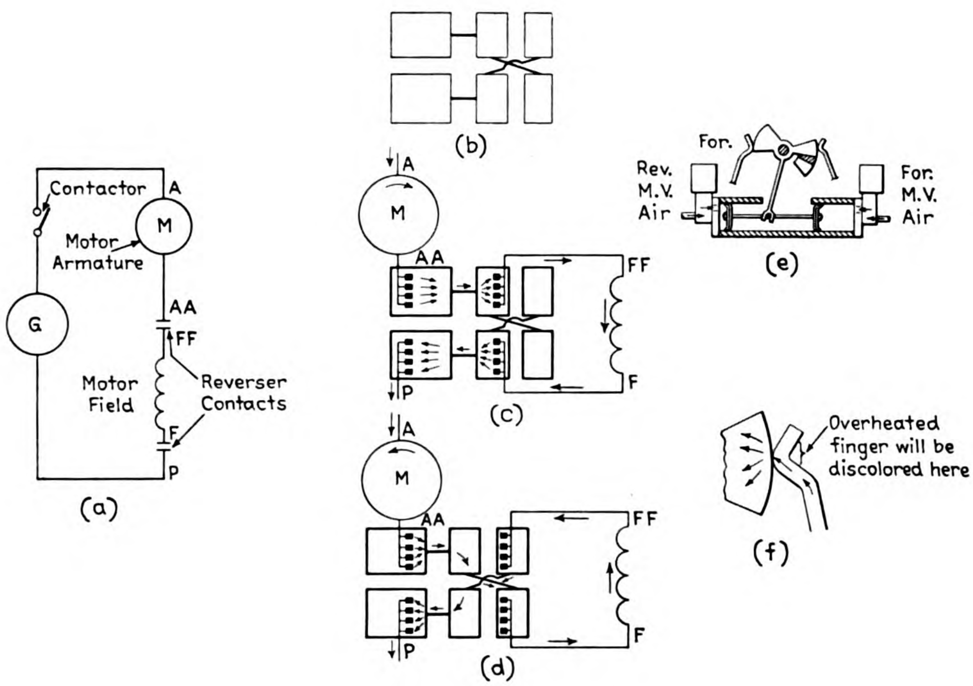


Fig. 2—How a drum-type reverser operates

Note that the current flows from *FF* to *F* through the motor field. Now look at Fig. 2d. This shows the reverser thrown to the other direction. As you follow the arrows you will see that the current through the motor field has reversed and now flows from *F* to *FF*. So the motor will turn in the opposite direction and the locomotive will back up.

The reverser is thrown by an air piston and magnet valve like that used on an air-operated contactor. To get both motions two pistons and two magnet valves are used, as shown in Fig. 2e. When the engineer moves the reverse handle on his controller to the forward position, current flows through the "forward" magnet valve coil. This opens the valve and admits air to the right hand cylinder. The pressure forces the piston and reverser drum to the position shown. When the engineer moves the reverse handle to the reverse position, current flows through the "reverse" magnet valve coil. This admits air to the left hand cylinder. The air piston is forced to the right, moving the drum to the reverse position.

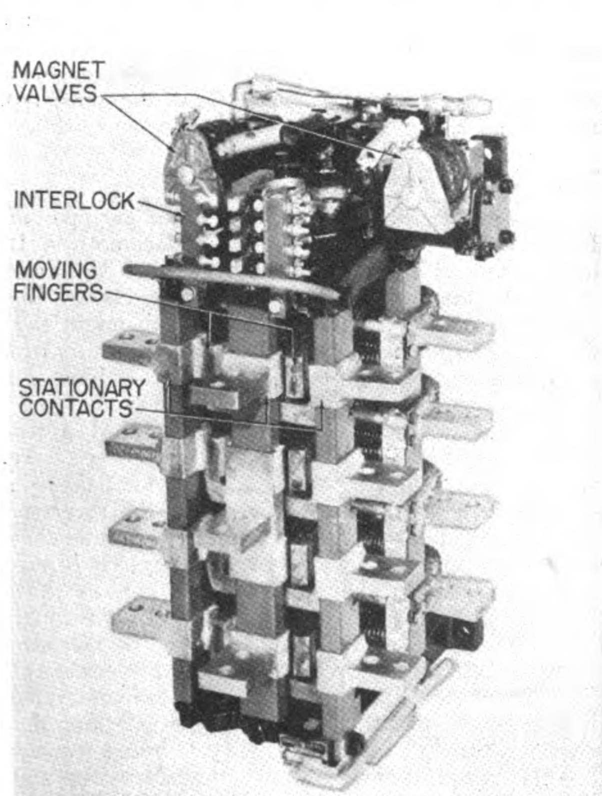


Fig. 3—A finger-type reverser used on diesel-electric locomotives

The magnet valves and piston packings require the same sort of maintenance as already described for air-operated contactors. If the packings are not kept lubricated you will have a sluggish reverser. This can cause the locomotive to act up like a clown.

Reverser air lines are important too. A leaky line can cause sluggish reverser operation. If a line breaks it will make the locomotive dead in one direction. Leaks should be fixed as soon as they are found. A small leak today may be a broken air line tomorrow.

The fingers on a reverser are just as important as the fingers on your hand. In Fig. 2f you see an enlarged view of a finger resting on a segment of the drum casting. Arrows show the path of the current from the finger into the segment. On this particular reverser there are four fingers for each incoming connection. Each should carry its share of the current. Otherwise there will be trouble. Here are a few points to watch.

When the reverser throws there is sliding contact between the fingers and segments. To cut down friction and wear you should keep a film of lubricant on the segments. This lubricant can give you trouble in two ways. First, it may get dry and gummy. This usually happens if the segments are not lubricated often enough, or if the locomotive is operating in a very hot climate. Second, the lubricant may get dirty. Either gummy or dirty lubricant may build up under some of the fingers so that they do not carry current. This means that the rest of the fingers will have to carry all of the current. These overloaded fingers will get hot. You can spot them by a bluish-purple color on the back of the finger where it touches the seg-

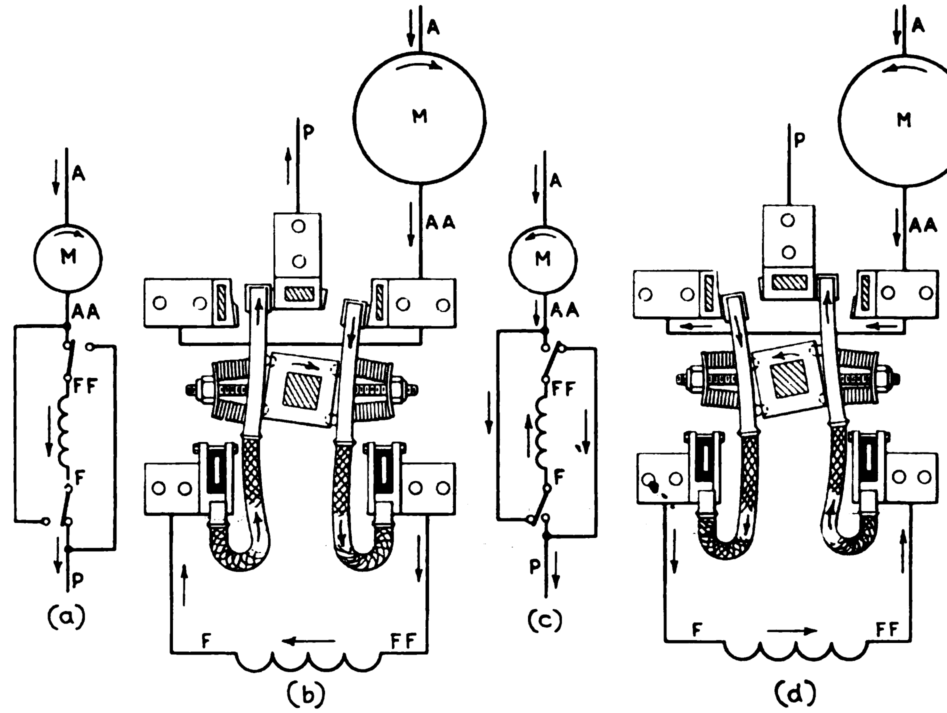


Fig. 4—How a finger-type reverser operates

ment (Fig. 2f). If the dirty fingers are not cleaned up and put back to work, you will end up with a welded reverser. This means a dead locomotive unit when traveling in one direction. It also means a repair job for the shop. A good way to avoid such trouble is to periodically wipe the drum with a cloth soaked in cleaning solvent. Then apply clean, fresh lubricant. The climate in which your locomotives operate and the lubricant you use will largely determine how often this should be done.

Contact pressure is another point to watch. If it gets low because of poor adjustment or wear, the fingers will overheat. In general, the fingers can be used until they are worn half-way through before replacement. If the pressure is too high, the fingers will wear rapidly and will cut grooves in the segments. When the finger path is worn more than 1/16-in. deep, the drum should be taken out and turned on a lathe.

Since a reverser must be lubricated, some oil will likely get onto the insulated surfaces. Here it will collect dirt. In time a conducting film will be formed over the insulation. Then a ground or creepage failure will follow. So, from time to time, wipe these surfaces with a cloth soaked in an oil solvent.

Sometimes a reverser throws while carrying current. This is usually reported as a flashed reverser. You can

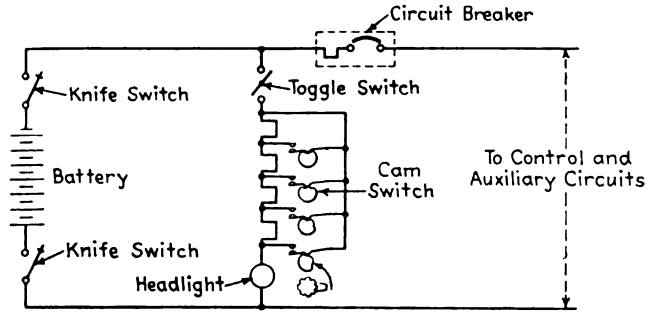


Fig. 5—How control switches are used in Locomotive auxiliary circuits

recognize it by the burned edges of the segments and fingers. When you find a flashed reverser, you had better clean it up. If you don't you may have a burned up reverser the next time you look at it. Badly damaged fingers should be replaced. When you replace a finger, adjust the contact pressure according to your instruction book. If the damage is slight the finger can be cleaned up on a grinding wheel or with a fine file. A file can also be used to clean up the segments unless they have been badly damaged. In that case they will have to be turned on a lathe.

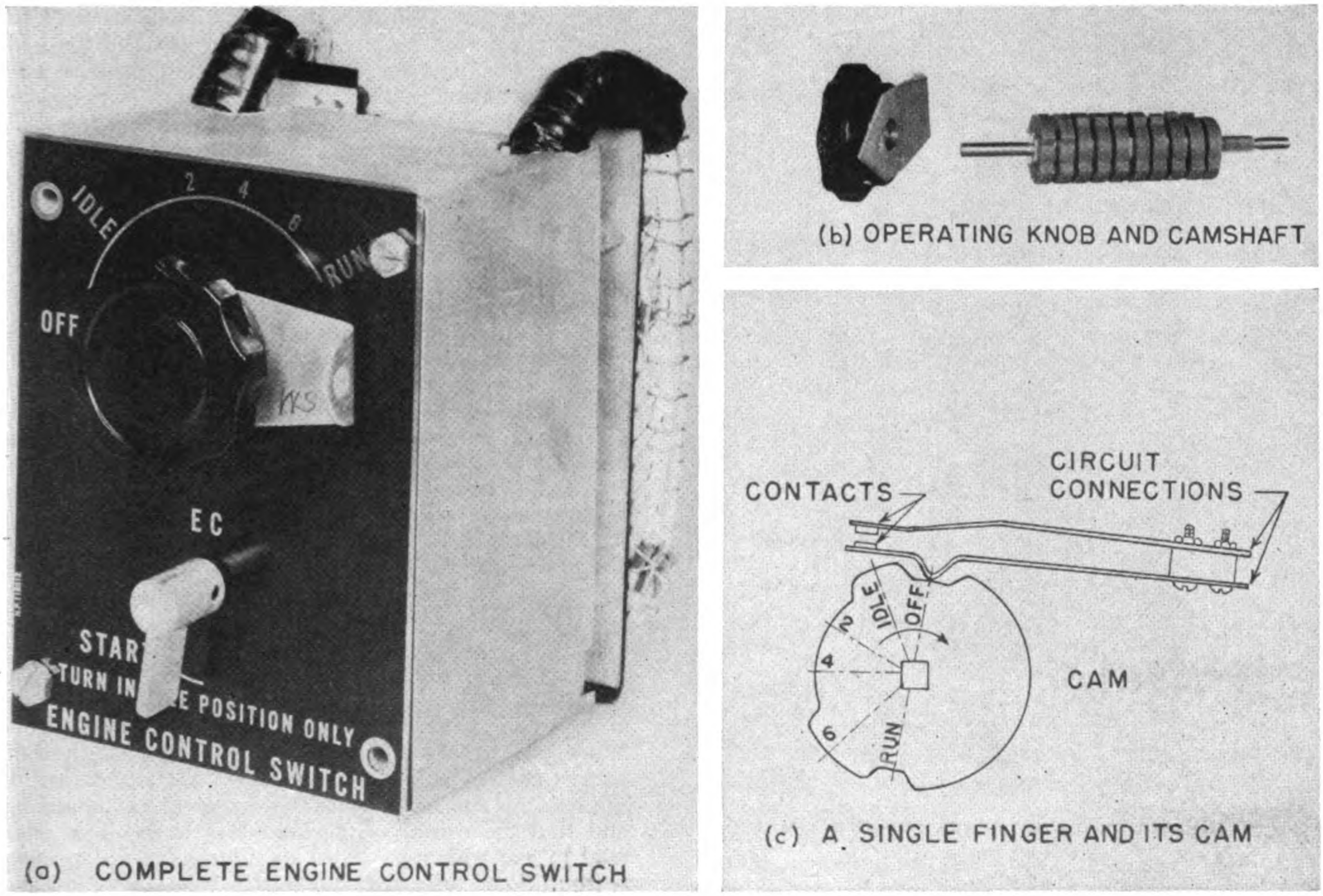
A reverser has interlocks like those used on air-operated contactors. They will need about the same type of maintenance.

The Finger-Type Switch

The reverser shown in Fig. 3 is an example of the finger-type of power switch used on locomotives. It has moving fingers instead of a drum to switch from one circuit to another. In many ways these fingers are like the contactors we have already studied. You might say that this switch is made up of air-operated contactors with the arc chutes and blowout coils left off. It combines a number of switches into one unit to save space.

Figure 4a shows the wiring diagram of a traction motor armature and field, and a finger-type reverser. Here current is flowing through the motor field from *FF* to *F*. Figure 4b shows two fingers of the reverser with the motor armature and field connected. Arrows show the path of the current through the reverser. To reverse the motor we want to change the connections as shown in Fig. 4c. Then the current will be flowing through the motor field from *F* to *FF*. This is done by throwing the reverser. Instead of turning a drum in this case we simply turn the contact finger support, as shown in Fig. 4d. If you trace the current path now you will find that the direction through the motor field has been reversed.

This type of switch has two magnet valves and two pistons similar to those on the drum switch. They require about the same type of maintenance.



(a) COMPLETE ENGINE CONTROL SWITCH

(b) OPERATING KNOB AND CAMSHAFT

(c) A SINGLE FINGER AND ITS CAM

Fig. 6—A cam-operated switch, showing some of its parts and how it works

Since the reverser contacts do not break current, they will require little if any maintenance. They should last much longer than contactor contact tips. Replacement is seldom necessary between overhauls. The contact surfaces should be treated like those on air-operated contactors. By all means do not treat them like the drum-type switch. Since these fingers do not slide on a drum they do not require lubrication. If they are lubricated, the oil will collect dirt and will cause the fingers to insulate and burn. If somebody has made a mistake and lubricated these fingers, they should be wiped off with a cloth soaked in oil solvent.

The contact surfaces on this reverser are silver. Because of this, a file should never be used unless it is absolutely necessary. Contacts can be used until the silver is nearly worn through, provided contact pressure is maintained. Lubricate pivot points, bearings and gears, if used, according to your instruction book. If a stationary contact overheats, be sure to take a careful look at the insulation on its support bar. If the insulation has been damaged by heat it is best to replace the bar.

Another Job for Power Switches

Some locomotives have what is called dynamic braking. On these locomotives the engineer can use the traction motors to brake his train on down grades, and also to help bring it to a stop. Of course, the motor circuits must be rearranged for dynamic braking. A power switch similar to the reverser is used to do the job. It is called the braking switch. In changing from motoring to braking, the power is first cut off from the traction motors. Then the braking switch throws to set up the braking circuit. In going from braking to motoring, the braking current is first cut off. Then the switch throws to set up the motoring circuit. So you see the braking switch, like the reverser, does not throw while it is carrying current. It should be maintained in the same way as described for reversers.

Control Switches

There is another line of switches used on diesel-electric locomotives. These switches are in the low voltage battery control circuits and are called control switches. They differ from power switches in that they may interrupt circuits that are carrying current. This current is usually small, however, and forms only a very small arc. Fig. 5 shows a typical circuit including the principal types of control switches. Let's take a look at them.

TOGGLE SWITCH. A common example is the wall switch you use to turn the lights on and off at home. Because of its snap action it is well suited to open or close low-current circuits. Most of these switches used on locomotives are sealed and need no maintenance. Wires are usually connected to them by means of screws. It is a good idea to keep these screws tight.

CIRCUIT BREAKER. This is little more than a toggle switch with a trip mechanism added. It is designed to carry a certain current, which is usually marked on the switch. The trip is a bimetallic strip which heats up when it carries current. Currents in excess of the rating, heat the strip enough to trip the breaker. The greater the overload the quicker the breaker will trip. There is very little maintenance on a circuit breaker. If you are having trouble, here are some things to look for—

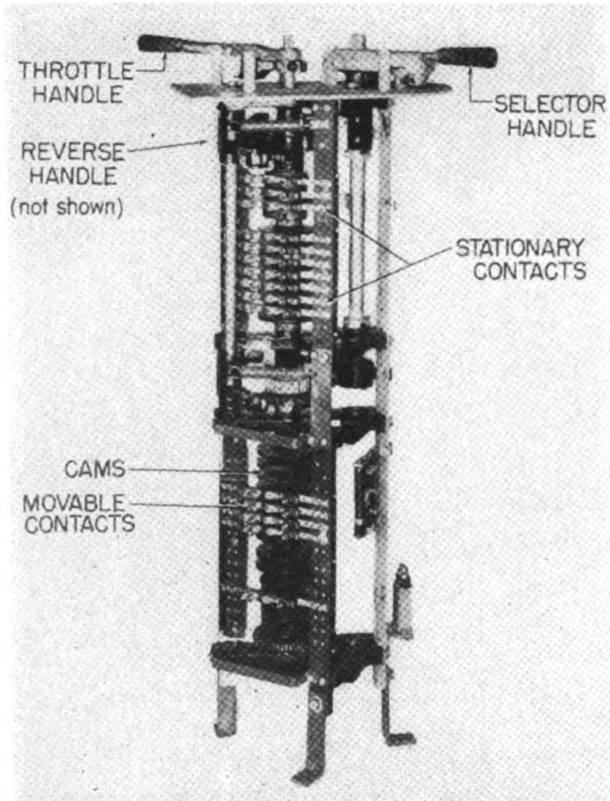


Fig. 7—A master controller used on diesel locomotives, cover removed

A loose connection to the switch may be causing overheating. This may not damage the breaker, but it will cause a false operation of the trip.

If the breaker is located near some equipment that gives off a good bit of heat, it may trip falsely.

At times you may find a breaker that is sensitive to shock. This means that if you bang the panel where it is located it may trip.

Look for these things before you change out the breaker or check the circuit connected to it.

CAM-OPERATED SWITCHES. One type of a cam-operated switch is shown in Fig. 6. Often a number of these switches are combined to form one unit. If the cams are arranged on a single shaft, you can get a number of circuit combinations simply by turning the knob. Good examples of this are the motor cutout switch and the engine control switch. Dirt and oil are the worst enemies of these switches. They build up an insulating film between the contact surfaces and the switch can't complete the circuit. When covers are used they help to keep the dirt out. If oily dirt accumulates on the fingers, it should be removed with a small paint brush and an oil solvent. Don't use sandpaper or emery cloth on the tips. If you have to dress them down, use a fine ignition file.

KNIFE SWITCH. This is one of the simplest means of opening and closing an electric circuit. The battery switch on locomotives is, in most cases, a knife switch. It is used to disconnect the battery from its circuits when the locomotive is shopped. Normally a knife switch needs little or no care. If it has been opened when carrying a large current, arc damage may have resulted. Then it will be difficult or impossible to close the switch. Use a file to smooth the damaged parts. When closing a knife switch be sure to push the blade all the way in.

The controller does one of the most important jobs on the locomotive. It changes the engineer's wishes into electric signals. Wires carry these signals back to the relays, contactors, reversers and other parts of the locomotive control system. By operating the throttle, reverse and selector handles, the engineer can start, stop, reverse, speed up or slow down the locomotive. Moving these handles operates switches inside the controller which open or close the various control circuits. Many controllers, like the one shown in Fig. 7, use cam-operated switches. There are also some drum-type controllers. These are similar to drum-type reversers except they are smaller.

Most controllers have mechanical interlocking between the handles. This is to prevent the engineer from moving the wrong handle and damaging the electric equipment. For instance, the reverse handle cannot be moved unless the throttle handle is in the "off" position.

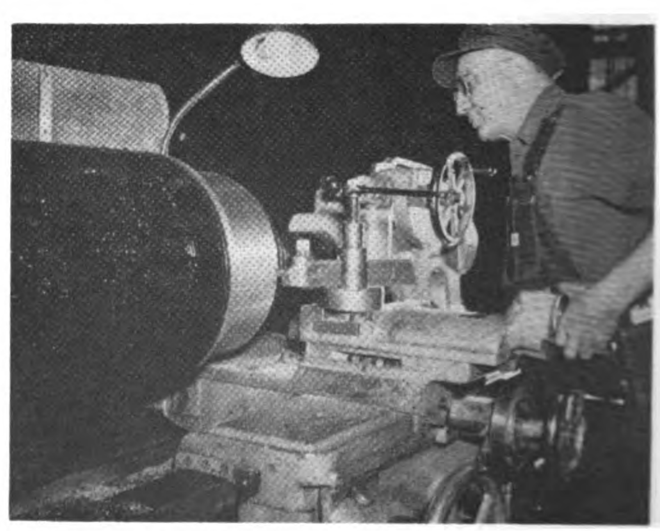
Normally controllers require little maintenance. Loose connections and dirt on the contact surfaces are the most common causes of trouble. At times you may also find fingers that have been damaged by arcing. These should be replaced. Other difficulties will usually be reported by the engineer. You will have little trouble in finding what caused them.

Fuses

Fuses are used on locomotives in much the same way as in your home. They prevent damage of the wires and electric equipment in a circuit when an overload occurs. When you replace a fuse, be sure the new one has the correct current rating. This is usually plainly marked on the fuse. If the new fuse blows, better check the circuit and find the cause. Experience has shown that fuses tend to age with use. Then they blow for no apparent reason. Some fuses are built so that when they blow you replace the metal ribbon only. When putting in the new ribbon be careful not to bend it. If you do you will reduce its rating and cause it to blow much sooner than it should.

Little Things, but . . .

We all know the old proverb, "Great oaks from little acorns grow." It's as true with locomotives as with trees. If you plant the little acorns of good maintenance practices, you will grow the great oaks of reliable operation and high motive power availability.



Twenty-five-inch lathe used exclusively by the Great Northern for generator and motor overhaul

QUESTIONS AND ANSWERS

Diesel-Electric Locomotives*

ENGINE TEMPERATURE THERMOSTAT—OPERATION

605-Q.—How does the setting dial (16) function?
A.—Rotating the setting dial changes the total length of the element stem (17).

606-Q.—What changes are brought about by the alteration in element stem length?
A.—The position of the auxiliary lever at a given element temperature is changed, and thus the force exerted on the main lever by the main spring, at that temperature.

607-Q.—What must ensue to enable the thermostat to regain control?
A.—A temperature change at the thermal element is necessary to change the main spring force back to the value needed to maintain the desired branch line pressure.

608-Q.—How does the thermostat function as compared with the temperature gauge?
A.—The thermostat controls water temperature into the engine while the temperature gauge indicates water temperature out of the engine.

609-Q.—What is the difference in temperature?
A.—About ten deg.

610-Q.—At what range is the thermostat set?
A.—The thermostat is set with a throttling range of 10 deg.

611-Q.—What does this mean?
A.—A temperature variation of plus or minus 5 deg. about a control point of 150 deg. F.

612-Q.—How will the shutters therefore operate?
A.—From a closed position with the fan stopped (145 deg. and 17 psi.) branch line pressure to an open position with the fan running at maximum speed (155 deg. and 0 psi.) branch line pressure.

613-Q.—How is the control point setting changed?
A.—Remove the cover by unhooking the spring latch, then turn the setting dial (16) in the proper direction as indicated by the marking on the dial.

614-Q.—How is the calibration checked?
A.—Immerse the element in a 150 deg. F. bath and let the system balance out. If the branch line pressure is not sufficiently close to 8 psi., loosen the two dial plate locking screws and turn the knurled setting knob until the branch line pressure registers 8 psi. Tighten the two locking screws.

615-Q.—How is the cover replaced?
A.—To replace the cover, wrap it around the head of the instrument and snap the spring catch back in place.

616-Q.—What may impair the operation of the thermostat?
A.—Dirt or dust collecting on the lever system.

617-Q.—How may this be prevented?

* This series of questions and answers relate specifically to the Alco-G.E. Diesel electric locomotives. The figure numbers and references, by number, to diagrams, etc., relate to the current edition of the Alco-G.E. operating and maintenance manual.

A.—This can be prevented by blowing out such an accumulation with a low pressure air stream.

PNEUMATIC-ELECTRIC RELAY

618-Q.—What is the Pneumatic Electric Relay?
A.—The Pneumatic Electric Relay is a pressure control with a non-adjustable differential.

619-Q.—What is the operation?
A.—Air pressure, at a predetermined setting, operates a single pole double throw snap switch through a low pressure bellows.

620-Q.—What is the operational design of this relay?
A.—The relay is designed to convert the gradual air pressure changes into positive electrical switching action.

621-Q.—Reference to Fig. 8, how is the cut-in pressure set?
A.—Set the pressure indicator (6) at the cut-in pressure desired by means of the pressure adjustment screw (2).

622-Q.—What happens on a rise in pressure?
A.—On a rise in pressure the switch will break contact red to blue at the main scale setting plus the differential Fig. (9).

623-Q.—What happens on a drop in pressure?
A.—The switch will make contact red to blue at the main scale setting.

624-Q.—For example, if the pressure setting indicator is set at 11 pounds and line pressure is 0 psi., how is the switch?
A.—The switch will be making red to blue.

625-Q.—What happens when the line pressure reaches 11 lb?
A.—When the line pressure reaches 11 pounds plus the differential or approximately 12.5 pounds, the switch will break red to blue.

626-Q.—When the line pressure is above 11 lb. and then decreases, what is the result?
A.—The switch will make red to blue at the main scale setting of 11 lb.

627-Q.—What should be done after the controller has been installed?
A.—After the controller has been installed, wired and set, it should be tested by raising and lowering the pressure to make sure that it operates the radiator fan properly.

628-Q.—What may be done if the cut-in and cut-out points do not agree with the pressure gage?
A.—In this case the scale plate on the controller may be moved slightly up or down until the gage and plate agree.

629-Q.—What precautions should be observed when checking the operation?
A.—It should be borne in mind that this controller has been carefully checked at the factory with an accurate gage, therefore maintenance personnel should be sure to use accurate pressure gages when checking the operation.

SHUTTER-GRAD-U-MOTOR

630-Q.—What is the Grad-U-Motor?

A.—The Grad-U-Motor is a piston motor.

631-Q.—Of what type is this piston motor?

A.—This motor is of the positive positioning non-bleed variable position type.

632-Q.—What functions to perform the piloting action?

A.—The piloting is performed by low pressure air (0-15 psi.).

633-Q.—What brings about the positioning of the shutters?

A.—The positioning of the shutters is accomplished through the use of main reservoir pressure.

634-Q.—What establishes the motor position?

A.—The air pressure in the Grad-U-Motor.

Schedule 24 RL

Air Brakes

Operation of F-Type Relay Valves

1400-Q.—Does this additional pressure affect the main diaphragm 38?

A.—Yes, this additional pressure is transmitted through the diaphragm stack to the main diaphragm *38*.

1401-Q.—In this case what ratio would be developed on the main diaphragm?

A.—Diaphragm *64* has an area of only 60 per cent of main diaphragm *38*, therefore the effective pressure on the main diaphragm is limited to this ratio.

1402-Q.—In response, what will the self lapping portion develop?

A.—The self lapping portion will develop approximately this ratio of brake cylinder pressure or, in other words, the brake cylinder pressure realized from any given reduction of brake pipe pressure will be approximately 60 per cent of the control pipe *16* pressure.

1403-Q.—What takes place at the F-6 relay valve as the brake cylinder pressure builds up?

A.—Brake cylinder pressure builds up in the central cavity *F* and acts on the right side of the main diaphragm in opposition to control pipe *16* pressure on the left.

1404-Q.—What takes place when the pressures on the main diaphragm become equal in force to that on the 60 per cent diaphragm?

A.—When the pressures thus become equal, spring *42* returns the piston *36*, relieving the pressure on lever *43*.

1405-Q.—What then takes place?

A.—Springs *33* and *34* then seat the application piston valve *30* and its pilot valve *32*, and through stem *29* pivots the lever *43* at its upper end, holding the exhaust piston *25* and its valve *23* closed retaining brake cylinder pressure.

1406-Q.—In what position is the relay valve at this time?

A.—This is Lap position in which the relay portion maintains brake cylinder pressure against leakage.

1407-Q.—What action takes place in the event that brake cylinder pressure in chamber F is reduced?

A.—This will permit the greater force on the left of the diaphragm *38* to again open the application valve, permitting main reservoir air to flow to the brake cylinders until the balance is restored on the main diaphragm.

1408-Q.—Is the 60 per cent ratio of brake cylinder air to that in control pipe 16 maintained at all times on the F-6 relay valve?

A.—Yes.

1409-Q.—What is the initial flow of air in the F-6 relay valve when control pipe 16 air is reduced?

A.—When control pipe *16* air is reduced, air flows from chamber *A* and the check valve spring chamber to passages *16a* and *16*.

1410-Q.—What takes place as the air in the spring chamber reduces?

A.—As the pressure in the spring chamber reduces, chamber *K* air unseats check valve 51-b and flows to passages *16a* and *16*, reducing the pressure in diaphragm chamber *K* as control pipe *16* pressure is released.

1411-Q.—What area is thus affected?

A.—The effective pressure on the left face of diaphragm *38* is thus reduced proportionately.

1412-Q.—What then takes place?

A.—The greater force caused by the brake cylinder pressure on the right of main diaphragm *38* deflects the diaphragm to the left.

1413-Q.—As the diaphragm is deflected to the left what movement results?

A.—The piston *36* moves to the left relieving the pressure on the lower end of lever *43*.

1414-Q.—What takes place when the pressure on the lower end of the lever is reduced?

A.—Brake cylinder air then opens exhaust valve *23* and its piston *25* and flows to the atmosphere.

1415-Q.—What results from a partial release?

A.—Brake cylinder air will flow to the exhaust until the pressure on the right face of main diaphragm *38* is slightly below 60 per cent of control pipe *16* pressure.

1416-Q.—Suppose that control pipe pressure is completely released?

A.—In this event the exhaust valve and piston remain open, completely releasing brake cylinder air.

F-8 Relay Valve

1417-Q.—When an F-8 relay valve is used, to which chamber does control pipe 16 air flow after the inshot valve closes?

A.—The air flows into chambers *A*, *N* and *K* after the inshot valve closes, preventing flow of air to chamber *P*.

1418-Q.—What is the ratio of brake cylinder air to control pipe air on the F-8 relay valve?

A.—80 per cent of control pipe *16* pressure is reproduced in the brake cylinder.

1419-Q.—How does the operation of the F-8 relay valve compare with the F-6 type?

A.—The operation is similar.

F-1 Relay Valve

1420-Q.—How does the F-1 Relay valve differ from the F-6 and F-8?

A.—With the *F-1* relay valve no inshot portion is used.

1421-Q.—How does the air from control pipe 16 flow through the F-1 relay valve?

A.—Through strainer *17*, passages *16*, *16a*, *17*, *17a*, *18*, *18a*, *19* and *19a* to diaphragm chambers *A*, *K*, *N* and *P*.

1422-Q.—What pressure is thus reproduced in the brake cylinders?

A.—The pressure in control pipe *16* is reproduced in the brake cylinders.

1423-Q.—How does the air flow during a release?

A.—Release is the reverse flow of air into control pipe *16*.

EDITORIALS

A Basis for Planning

In the last decade alone many millions of dollars have been spent by the railroads of this country for maintenance and servicing facilities for diesel-electric locomotives. When this type of power began to be installed in substantial numbers the large and medium sized roads found themselves in the position of having to operate,—and at the same time maintain a new type of motive power without having the benefit of any past experience as a guide to the kind of shops and terminals needed to carry on the job efficiently and economically. Shops they had to have and they proceeded to build new shops and convert old ones to suit individual needs and patterned after a variety of individual ideas. The roads did, however, carry on the job and as daily experience produced the answers to many problems, the general character of facilities began to take shape.

The money that has been spent has not, by any means, been spent without rhyme or reason nor has any substantial part of it been wasted. In the light of ten years experience, though, much of it might have been spent for different purposes. That we now know and as matters now stand, the exploratory era of diesel shop and terminal design and construction is about over, and the basis for sound future planning is available.

Plans can not be made without facts. In engineering work the production of facts is synonymous with the collection of quantities of data. With respect to diesel facilities this has now been done and the railroad industry is indebted to the shop engineering committee of the Locomotive Maintenance Officers' Association, under the chairmanship of H. E. Niksch for assembling the data, by questionairre and otherwise, that was presented at the recent annual meeting of that organization in Chicago, an abstract of which appears on pages 77 to 81 of this issue. Here, for the first time, is not only a broad picture of what the railroads have done, but the arrangement and interpretation of the data serves as a guide to future planning.

This report is a presentation of the mechanical and electrical side of the maintenance work that the railroads have to do. The text of the report offers suggestions, of necessity general in nature, that will at least serve as a check list in any planning that any railroad, large or small, may need to do. When this information, limited though it may be, on the mechanical department's side of the shop problem is added to the shop structures and layout information available from A.R.E.A. Buildings Committee Reports during the past ten years we now have something upon which practical future decisions may be based.

It may not be out of order once again to suggest the great need for intelligent shop engineering as a controlling factor in planning future expenditures for diesel-electric facilities. The stakes are large and the potential savings over a period of years enormous. It is to be hoped that the engineering, mechanical and electrical groups in the industry may visualize the possibilities of collaborating in the production of additional data of such character that in the future no railroad need be at a loss for a place to turn to for "expert advice".

A Big Accident From a Little Slip-Up

Performing one seemingly minor detail of a road's operating instructions—the carrying out of which cost but a fraction of a cent and a few seconds time—would have saved a crankcase explosion causing extensive material damage and serious injury to a fireman.

The history of this case dates back several months to when a three-unit freight diesel left its terminal hauling a scheduled freight train. The locomotive proceeded some 675 miles without unusual incident; then the engine in the center unit stopped.

When the engine stopped, the fireman found a fuel injector lay-shaft disconnected and the engine shut down. He connected the lay-shaft and started the engine but could not keep it running, due to low lubricating oil pressure. Movement with the engine shut down was made for the next seven miles.

A machinist at this point inspected the unit and found the lay-shaft again disconnected, no oil showing in the engine governor gage glass, and the engine oil very hot, although the cooling water temperature was not excessive. He connected the lay-shaft and started the engine, but lube oil pressure would not rise above 4 lb. He then shut the engine down and made an entry on the work report of the lead unit, stating that the middle unit was not to be used because of no lube oil pressure.

The train proceeded under the two good units to the next division point, some 125 miles away, where the crews were changed. The train departed this point with a total load approximately equal to 80 per cent of the tonnage rating for two units. It traveled a little over five miles when a crankcase explosion occurred as the fireman was attempting to start the engine. He was burned about the head and arms, and the engine sustained substantial damage.

No one thing can be said to have caused this accident. Inspection of the unit following the accident showed a number of defects which contributed to setting up the conditions under which the explosion could occur. And an entry was made on the lead unit to warn the crew against starting the troubled engine in the middle unit.

But one thing could have prevented the accident—attaching an isolation tag to the defective engine, as re-

quired by this and other road's instructions, which would have warned the fireman not to try to start the engine. This detailed overlooked by the mechanic was in a way less of a contributing cause to the accident than a number of other factors, such as some of the defects found on the engine at inspection, and the failure of the engine crew to read the work report which would have told them not to start the engine. It was nonetheless one small thing which would have prevented the accident if it had been done. As such, it can serve as a good lesson on the importance of paying attention to small details, and not to be in such a rush to get things done that operations are skipped which are seemingly small. but actually important.

Flashovers

During the early years of diesel-electric locomotive operation, little was heard about motor and generator flashovers. To be sure there were not so many locomotives to cause them, but they must have been fairly common, since neither equipment nor maintenance procedures had reached their present high standards. Occasionally, someone would ask questions about flashovers, but it was done surreptitiously as if having flashovers was something like having a disease one didn't want to admit having. It seemed that to admit having them was to cast doubt on the quality of the locomotive or of the work done in the repair shop.

With the issuance of the Locomotive Maintenance Officers' report on this subject, it becomes plain that the reason for such reticence was that no one knew anything about them. This report, a summary of which appears in this issue, is a frank statement of the whole situation surrounding this subject. It is approached with a candor which is refreshing. From this kind of a beginning, good results are sure to follow.

And the report is not all in the negative. Many practices are listed which should reduce the frequency of flashovers. Summed up, they state that what is needed is good maintenance, with an emphasis on cleanliness and good operating practice. There must still be found ways and means for improving both, but with the kind of study now being made by the maintainers, the underlying causes and ways of correcting them are sure to be found.

The Modern Freight Car—A Fluid Bridge

In an address at Harvard University last May, L. K. Sillcox, executive vice-president, The New York Air Brake Company, cited the bridge as a perfect mechanical connection between two points, otherwise it would collapse and expressed the striking analogous thought that: "A freight car is a fluid bridge between shipper and consignee, the administration and handling of which is spread from one part of the nation to the other." The necessity of keeping this "fluid bridge" in the best mechanical condition practicable under present conditions is obvious, if car utilization and shipper service are to be brought up to desired standards.

The first step in any organized attempt to improve present freight-car conditions and performance is to analyze mechanical failures and find out which car parts are giving most trouble. Mr. Sillcox pointed to five classifications of defective parts as responsible for the following number of freight-train accidents in 1949, the latest year for which such data are available: wheels and axles, 511; bearings and lubrication, 634; truck side frames and side bearings, 213; draft gears and couplers, 334; brakes and foundation gear, 234; all other failed parts, 924; total accidents, 2,850.

An examination of these figures will show that 32.4 per cent or almost one third of the accidents were due to the failure of car parts outside of the five classifications which simply emphasizes the fact that no car parts can be safely overlooked as regards inspection and maintenance if they have any bearing on reliable train operation. Of the five specific classifications, bearings and lubrication accounted for 22.3 per cent of the accidents. Wheels and axles were next, being responsible for 17.9 per cent. Draft gears and couplers were charged with 11.7 per cent.

In this connection the following interesting thought was presented by Mr. Sillcox: "We need, above all else, some sort of a simple indicator to show when anything is wrong in a train so that the engineman and the train crew can quickly take notice and protect the movement against disastrous wreck effects, such as have been all too common of late. The time will never come when we shall not have broken wheels or failed axles, cracked truck side frames or pulled out drawbars, hot boxes or foundation brake-gear failures, but there should be made available simple and positive means of immediately indicating when such parts are approaching a condition to cause failure. Any experienced car man knows that if we are to keep the hot box under control, intelligent car inspectors must be employed, and the rule of touching the end of the bearing with the bare fingers must be rigidly enforced, or its equal provided. The slightest dry spot at the end of the journal is indicative of trouble, and if a journal becomes overheated it does so gradually. At least two hundred to three hundred miles' notice of such a condition is usually present. The challenge is real—the solution evident—intensified inspection, adequate maintenance, both intelligently administered."

The difficulty which confronts railroads in successfully meeting the challenge mentioned by Mr. Sillcox is accentuated by what may be considered two conflicting objectives. One is the need for more careful and presumably more frequent inspection of freight trains in the interest of safety. The opposing need is to operate trains at ever increasing speed and with just as few and short stops as possible at intermediate terminals so that loads may be delivered to customers with minimum delay.

One thing which all responsible mechanical and car department officers will say is "We must have time and car-yard force necessary to inspect these trains!"

A Southern Pacific car hot-spray coated at San Francisco in February 1952.

Hot-Spray Finish Applied Under Varied Conditions

Hot spray coated under widely varying conditions, from indoor laboratory control to midwinter weather, nearly 600 freight cars finished by means of the hot-spray application of enamel developed by the Sherwin-Williams Company, Cleveland, are currently in regular service on a number of railroads. Steel freight cars, tank cars and hopper cars have been hot-spray painted since the Pullman-Standard Car Manufacturing Company and the Sherwin-Williams Company jointly demonstrated the process last November at Michigan City, Ind.

The initial demonstration in the Pullman-Standard shops was under controlled conditions, but hot-spray enamel has since been successfully applied under divergent conditions. Pullman-Standard used the new process in finishing 250 steel freight cars for the Chicago, Rock Island & Pacific. Ten steel box cars that were hot sprayed for test in 1948 are also CRI & P cars.

Shippers Car Line Corporation employed the hot-spray method to finish tank cars at Milton, Pa., in January. This was done in two shops, one heated the other unheated.

Five Norfolk & Western steel box cars which were hot sprayed are now in rugged work-a-day operation. The Atlantic Coast Line is hot-spray finishing a number of freight cars experimentally.

One carrier, which now has about 80 hot-spray finished cars in service, painted six freight cars out-of-doors at Buffalo in February and these also are in regular service. The application was carried out in temperatures ranging from 24 to 32 deg. F.

A hot-spray coat is usually double the thickness of the conventional two-coat spray job.

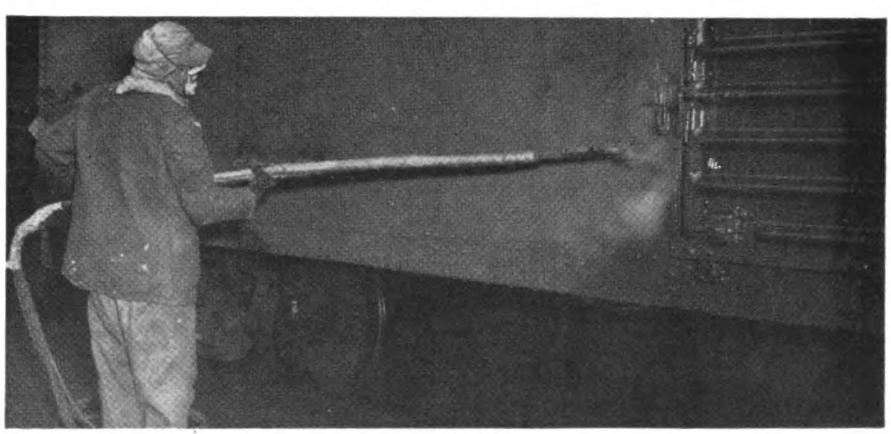
The spray equipment consisted of a DeVilbiss MBC gun, with a 7-ft. extension whip. Three Bede unit heaters maintained the spray material at temperatures from 140 to 185 deg. F. at the gun. A circulating pump was employed. Paint was supplied to the heater by means of 40 to 60 lb. air pressure. Atomizing pressure was estimated at 40 to 50 lb.

Each of the 40-ft. steel cars was first primed with Chromate primer. In measuring the single hot-spray finishing coat with a Pfund gage, the indicated average thickness of the coat was two mils (thousandths of an inch). This compares with an average of one mil dry film thickness per coat on conventionally finished cars.

The tank cars hot sprayed in January by staff painters at the Shippers Car Line shops also averaged a finish coat of approximately two mils. The hot spray material was applied indoors, but, again for experimental reasons, in the heated and unheated shops. In the unheated shop the temperatures ranged from 40 to 43 deg. F., while out-of-doors it was actually a few degrees warmer. Humidity in this shop was estimated in the high 80's. In the heated shop the tank cars were dry to stencil in about three hours. In the unheated shop drying to stencil required about six hours. Overnight, however, the surface was tack free and thoroughly dry in spite of visible condensation on some parts of the tanks.

One rebuilt exterior-post car and one new interior-post car were hot sprayed by Southern Pacific painters in February at the Bayshore shops, San Francisco, and at the Sacramento shops. Prime coats were applied to both cars. These demonstrations were out-of-doors, with seasonally mild west-coast temperatures prevailing.

The heating equipment in both cases consisted of two Bede heaters in tandem, each rigged to an apparent potential of 185 deg. F. At San Francisco a pole type extension Binks spray gun was used, equip-



Hot-spray coat being applied outdoors in Buffalo demonstration at freezing temperatures and below.

ped with an internal-mix air cap. Best results were obtained with a No. 66 fluid tip in conjunction with this equipment. A pressure tank provided approximately 15 lb. pressure on the material and about 60 lb. atomizing pressure. Equipment in the Sacramento demonstration was the same except for a Binks spray pump, No. A-22, with 16 lb. material pressure equipment in standard used at the Sacramento shops.

The technical report on the San Francisco demonstration said in part: "The material, when applied at normal speed, was found to have a temperature at the gun of approximately 150 deg. F. This was quite satisfactory and allowed the proper film build without the problem of running or sagging. The wet film thickness, checked by a Pfund gage, was found to average approximately two mils over the entire surface. The average two-coat coal spray, when applied by conventional methods, is approximately one mil. Over-spray was hardly noticeable, being much less than when conventional methods are used.

"The application of one coat of hot-spray material required the same amount of time as the application of one coat of cold-spray material. However, the drying was much more rapid and stencils could be applied in approximately two hours after spraying. This will vary according to weather, humidity, etc. The gloss was increased by at least 15 per cent over two coats of cold-spray freight-car paint application."

At Sacramento the wet film averaged two mils in thickness and, according to the technical report, could be built to a three-mil thickness without sagging. "As this was a new car," the report added, "the surface preparation was better, excellent finish film was noted, and properties with regard to film tightness and gloss were particularly outstanding."

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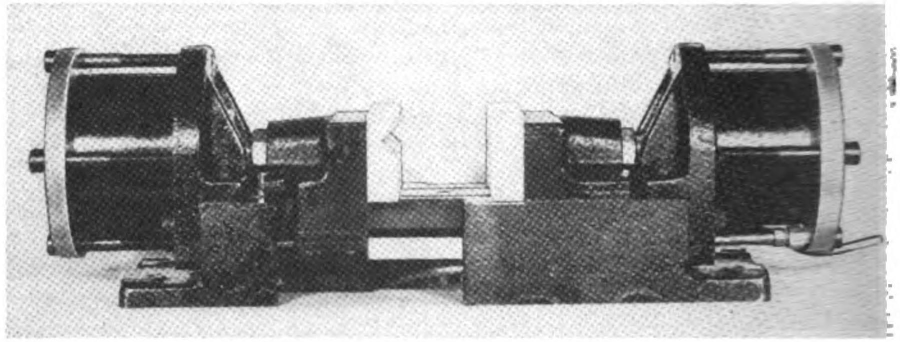
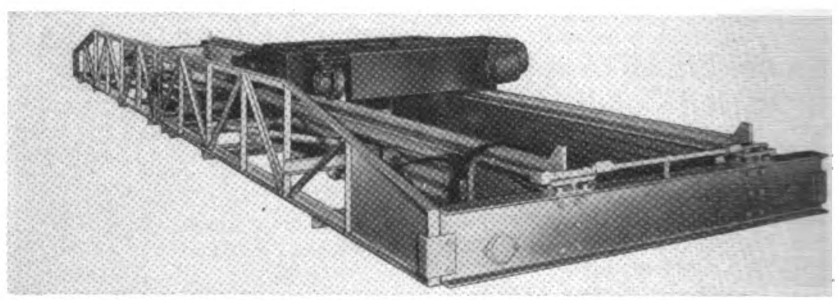


Air Powered Mechanical Vise

The device consists of two opposed pneumatic cylinders mounted on a base with two master jaws at the ends of the rods attached to the pistons. These jaws travel along guides and are mechanically synchronized. Operating on 5 to 100 lb. air pressure, a clamping pressure up to 2,000 lb. may be obtained.

Developed by the Black Drill Company, Inc., Cleveland, the jaw tolerance from the center line is plus or minus 0.001 in. at any dimension of jaw closing, with a working range of 0 to 4 in.

Identified as the Centr-Finder, the vise requires less than 2 sq. ft. of bench space. Four bolts hold it in place. One air-line connection to a 4-way valve places it in operation. Each jaw is independently adjustable from the center line to accommodate work pieces other than symmetrical.



Overhead Electric Traveling Crane

These new cranes, the series "D" Load Lifter are designed to provide adequate service for average industrial requirements. They require little overhead space but give high hook lifts and are available in a wide variety of speeds and heights of lift. Manufactured by the Shaw-Box Crane & Hoist Division of Manning, Maxwell & Moore, Inc., Muskegon, Mich., the line is made in three distinct types.

Features of the units include anti-friction bearings, rotating axles on both the bridge and trolley, variable speed magnetic control and gears operating in oil in sealed housings.

Lead-Lag Ballast For Slimline Lamps

A lead-lag slimline ballast combining series economy and size with lead-lag performance and dependability is now available from the Westinghouse Electric Corporation. The new ballast is available in 38, 58, and 75-watt two-lamp sizes. A 25 per cent reduction in wattage losses now puts lead-lag in the series-ballast class for operating economy. New circuiting and improved production methods have reduced the size of the ballast to 3⅛ in. by 2⅝ in. by 13¾ in. with a corresponding reduction in weight. The initial cost of the lead-lag ballast approaches that of the series ballast. Stroboscopic correction as well as long lamp life is obtained through the lead-lag circuit.

Air Compressor Replacement Cylinders

Cylinders made of air furnace gun iron have been marketed as replacement parts for diesel locomotive air compressors. The dense pearlitic structure of these cylinders, fabricated by Hunt-Spiller Manufacturing Corporation, South Boston 27, assure long service and even-wearing qualities, according to the manufacturer.

By design refinements and casting techniques, approximately 42% has been added to the area of the heat-radiating fins. This area is concentrated at the head-end of the cylinders where heat dissipation, to a greater degree, is required.

How Electro-Motive cuts your rebuilding costs

Repeated reductions in Electro-Motive flat-rate rebuilding prices—marked by the recent drastic cut in labor charges—are a source of savings every railroad executive should look into.

These savings—becoming effective during a period of inflation in other railroad operating costs—have been made possible by Electro-Motive's policy of bringing to *rebuilding* the same efficiencies and economies developed in original locomotive manufacture.

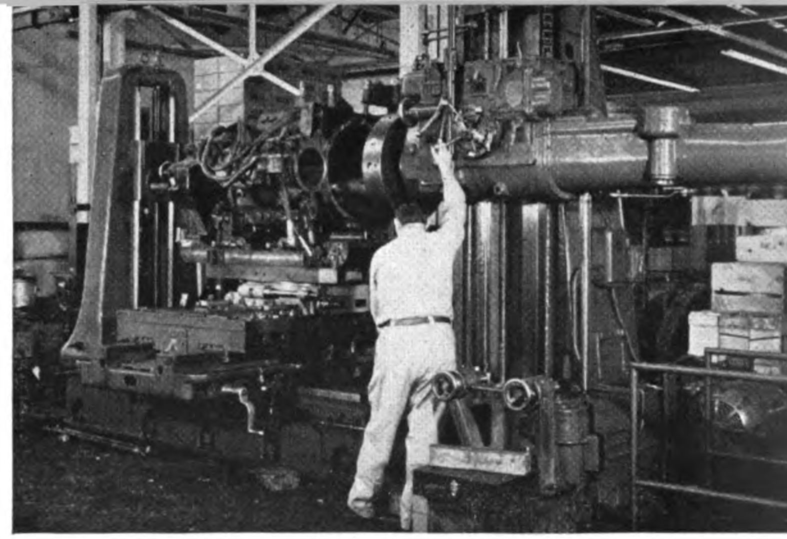
This has involved an extensive program of retooling and expansion in which our Factory Branches† have been completely transformed from job shops to assembly-line production-type operations.

Here you see some of the efficient factory-type equipment installed in these plants. The latest laborsaving methods and techniques are used and are kept constantly up to date. Rebuilding is done in volume on a station-by-station basis. This means skilled workmen can be regularly employed to do specific jobs, and also that mass-production jigs, fixtures and tools can be economically justified. In addition, factory-type inspection and quality control enable us to give you a new-part guarantee on every assembly we rebuild.

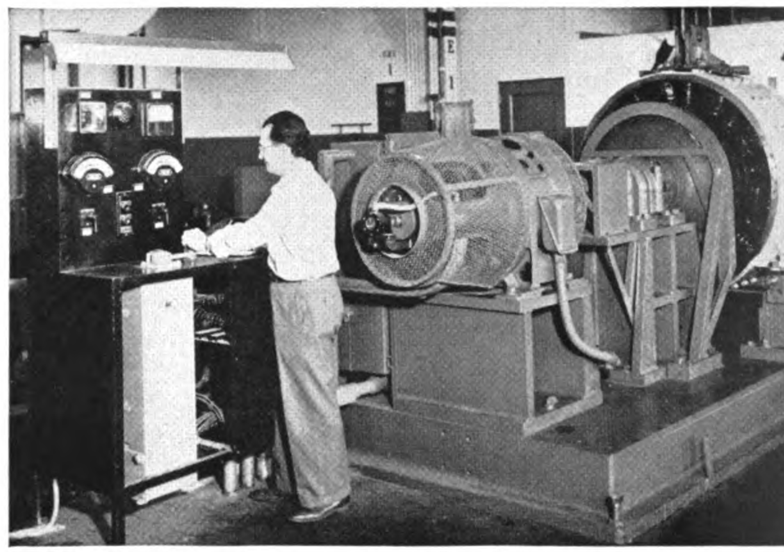
Beyond this, and most important, each Electro-Motive Factory Branch is strategically located and equipped to handle the combined requirements of a number of railroads. This not only spreads fixed costs over a larger number of units, but also saves railroads the necessity of making major and unproductive investments in rebuilding facilities that would duplicate these. Finally, it enables railroads already operating facilities of their own to level out uneconomical peaks and valleys in production by letting Electro-Motive handle the overflow.

Thus—through its nationwide network of Factory Branches—Electro-Motive accepts responsibility to help railroads handle the volume of Diesel rebuilding that looms ahead. Our organization is geared to deliver top quality work at the lowest possible cost.

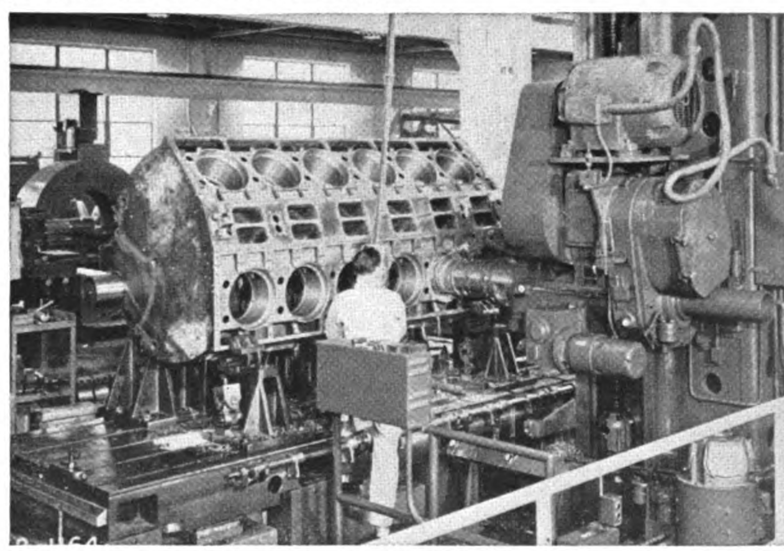
†Electro-Motive Factory Rebuilding Plants at La Grange, Ill.; Halethorpe, Md. (Baltimore); Jacksonville, Fla.; Robertson, Mo. (St. Louis); Los Angeles, Cal.; Emeryville, Cal. (Oakland). A seventh Factory Branch will be built at Salt Lake City, Utah. Branch Warehouses at Minneapolis, Minn. and Fort Worth, Texas.



We Spend—You Save—Machine tools like the one shown above are costly. This investment—and others like it—can only be amortized in a reasonable time through large volume operations. Machines such as this assure highest quality and cut time and costs—savings we pass on to you through lower prices.



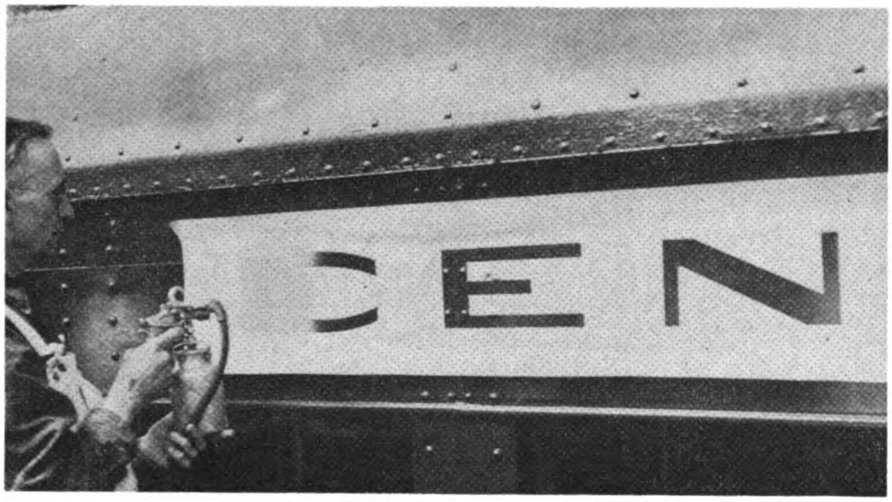
Testing Guarantees Quality—Inspection of rebuilding jobs is just as careful and complete as the factory inspection given new production. This enables us to guarantee the rebuild the same as a new assembly. We "carry" this performance insurance for you—you get it as a free bonus on every job.



The Right Tools for Every Job—Our factory at La Grange and branches on both coasts are equipped to handle *any* rebuild job from unit injectors to crankcases and complete engines.

GENERAL MOTORS LOCOMOTIVES

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS
La Grange, Illinois • Home of the Diesel Locomotive



Spray Lettering

Sprayed Lettering is a system for lettering trucks, railroad coaches, freight cars, etc., by means of a pre-cut stencil mask and a spray gun, using the better types of paint material that can be used only with a spray gun. This system was introduced by the C. O. Dicks Co., Detroit, Mich.

These masks are cut in quantity, to the customer's print or design, from a specially coated paper that is paint resistant. They adhere closely to a painted surface, yet are easily removed after spraying. Each stencil is used once in conjunction with an adhesive called Stickum.

The mask is placed in position and held at the top edge with a couple pieces of masking tape which acts as a hinge to lift the mask upwards and out of the way while a coat of the Stickum is applied with a paint brush, allowing to dry for about 5 minutes. The mask is then dropped back down into its original position. A small scrub brush is used to seal down the mask, which also removes the Stickum adhesive inside the letter openings in the same operation. The holding ties are cut and removed giving a solid, and not a stencil type of letter. The lettering color is then sprayed, and the mask can then be removed any time after spraying.

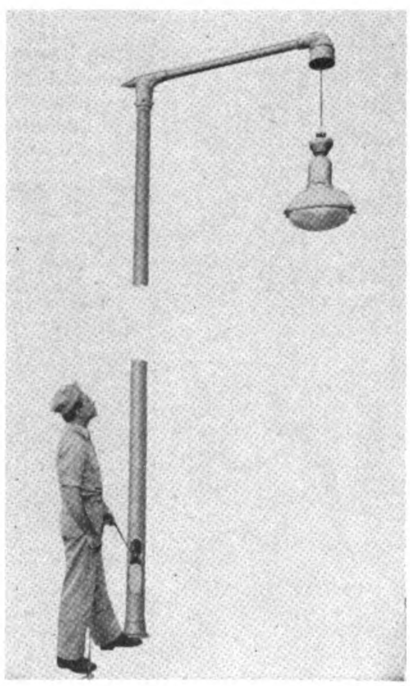
Lighting Fixtures Serviced on the Ground

The Thompson Electric Company, Cleveland, Ohio, has designed a disconnecting and lowering hanger for use with fixtures mounted on new standard metal poles. The maintenance man works at ground level with a dead fixture (the live contacts stay at pole top), and there are no climbing or electrical hazards. In addition, the fixtures can be serviced with greater frequency and minimum cost. The poles are available in various heights.

The new unit includes a pole-top fitting complete with self-contained pulley, a divided mast-arm, the stainless steel operating cable and a mast-arm and fitting. The mast-arm, a high-strength aluminum alloy extrusion, contains a Y-shaped partition for both increased stability, and separation of the movable operating cable from the electrical wiring. Diameter and wall thickness of this arm are comparable to 2-in. extra-heavy pipe.

The mast-arm and fitting, incorporating the Thompson hanger mechanism, features a self-contained "plumbizer" that provides for 8 deg. adjustment either side of the centerline. This assures accurate vertical suspension of the luminaire, which is desirable for proper appearance and essential for operation of the hanger assembly.

The new Thompson pole-top hanger can be adapted to new standard metal poles



by means of a fabricated tenon insert in the top of the pole. Poles equipped with this disconnecting and lowering device also require a hand-hole, complete with pulley assembly, at the bottom for access to the operating cable. In addition, mast-arms ranging from 2 ft. to 12 ft. in length, in 2-ft. increments, are available for use with the pole-top assembly. When arm length exceeds 8 ft., additional bracing is required; this is furnished by the pole manufacturer. The units are available in either single or double arm models.

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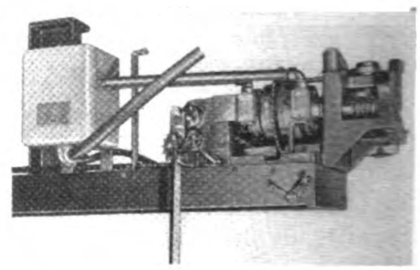
High Purity Aluminum Alloy

This new aluminum alloy, designated Alcoa C578, could be used as an economical and long-lasting replacement of chromium plating and stainless steel, according to its manufacturer. It is said to hold promise as a trim.

The product, which will take an Alumilite finish, has been developed by Aluminum Company of America, Pittsburgh 19. The alloy offers the added attraction of colored Alumilite finishes in many shades.

Alcoa C57S when treated, approaches aluminum in the transparency, metallic luster, and sheen of its finish, while offering good mechanical properties. It has, according to the manufacturer, excellent forming characteristics.

◆



Hack Saw Magnetic Clutch

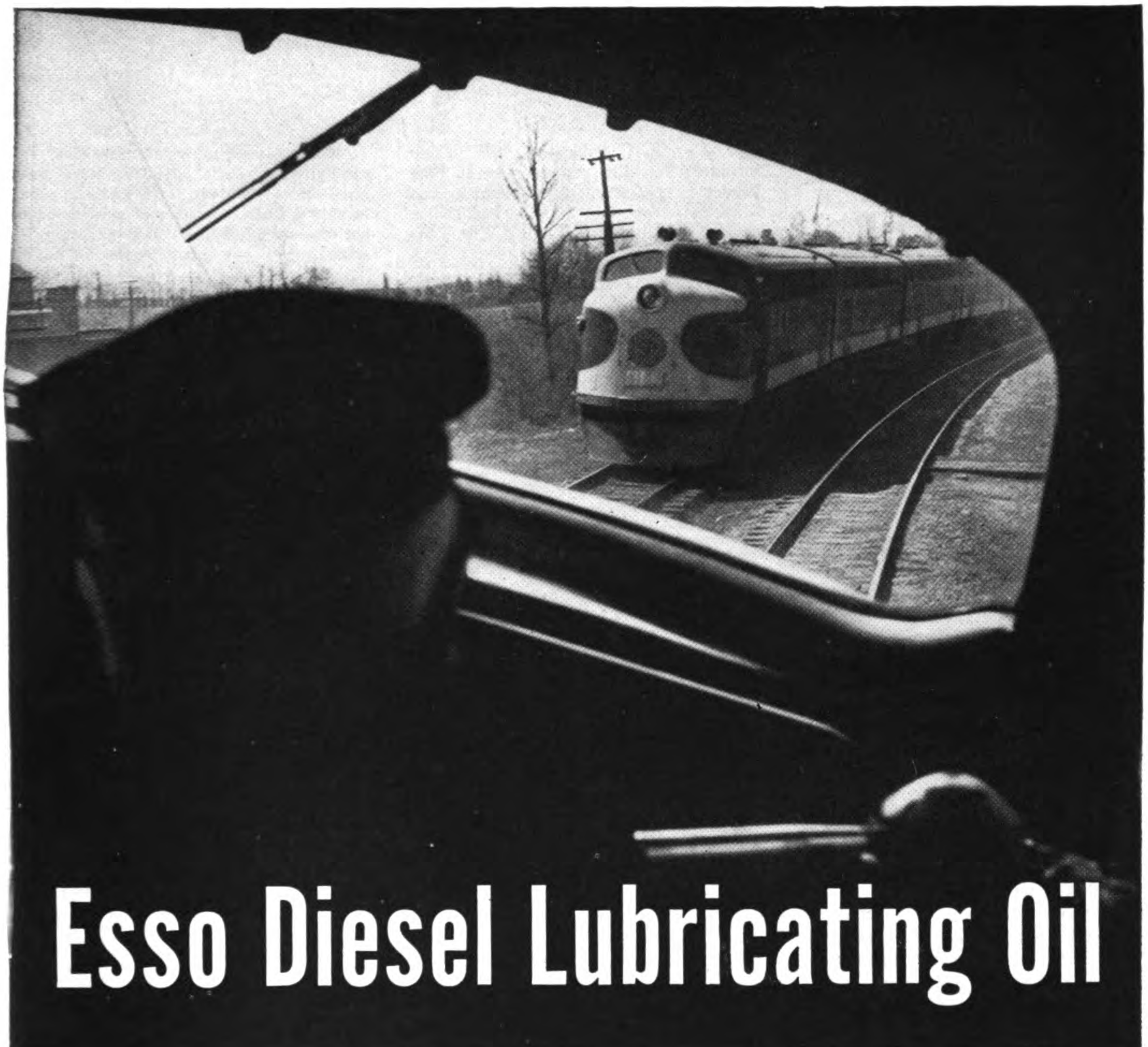
A permanently adjusted magnetic clutch to control the automatic feed conveyor for mechanical hack sawing machines has been announced by the Peerless Machine Co., Racine, Wis. With the device, the sawing cycle becomes fully automatic, following loading of the conveyor to completion of the last cut on the length of stock.

The clutch embodies a new principle wherein solenoids and mechanical linkages are eliminated. It has only three major parts, the constantly rotating center plate and two armatures. When either magnet coil is energized, the armature disc and rotor plate are attracted, and then drive through friction in positive magnetic couple.

Machines equipped with the stock feed conveyor will automatically saw desired lengths from bar stock, tubing, squares, channels, web sections, I-beams, etc. The conveyor is available for Mechani-Cut hack saws in 7 in. by 7 in. and 11 in. by 11 in. capacities. Conveyors can be furnished in 12-, 16- and 20-ft. lengths.

(New Devices continued on page 140)

"Tailor-made" for Railroad Diesels



A HIGH-QUALITY LUBE FOR REAL PROTECTION — Esso offers "tailor-made" diesel locomotive lubricating oil (Diol RD) developed through years of field testing and research by both engine designers and Esso scientists to meet needs of railroad diesels. High-quality Esso Diol RD gives dependable lubrication protection.

BACKED BY CONSTANT RESEARCH — continuing tests in the lab and on the road make sure that Diol RD keeps pace with progress and latest developments in railroad diesels.

BACKED BY CONSTANT FOLLOW-UP — on-the-job check-ups by Esso Sales Engineers watch the dependable performance of Esso Railroad Fuels and Lubricants. Be sure to call on Esso for any railroad fuel or lubricating problem.

The Sign of QUALITY — Esso — *The Symbol of SERVICE*

RAILROAD PRODUCTS

SOLD IN: Maine, N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Penna., Del., Md., D. C., Va., W. Va., N. C., S. C., Tenn., Ark., La.

ESSO STANDARD OIL COMPANY — Boston, Mass. — New York, N. Y. — Elizabeth, N. J. — Philadelphia, Pa. — Baltimore, Md. — Richmond, Va. — Charleston, W. Va. — Charlotte, N. C. — Columbia, S. C. Memphis, Tenn. — New Orleans, La.

NEWS

Wheel Report—A Correction

In the summary of the discussion of the report of the Mechanical Division Committee on Wheels at the San Francisco annual meeting on page 78 of the August *Railway Mechanical and Electrical Engineer*, one railroad was said to have reported two failures of F-36 wheels and that a third was found to be cracked. These failures were not F-36 wheels but A-40 wheels, and they were mentioned to call attention to the fact that the A-40 wheels, particularly in passenger service, are susceptible to the same types of failures as have previously been reported on F-36 wheels.

D.T.A. Reports Apprentices Can Get Draft Deferment

The Defense Transport Administration's Manpower Division has issued a pamphlet describing requirements and procedures by which industry apprentices may qualify for deferment from Selective Service. The pamphlet is entitled D.T.A.-Manpower No. 5, "Deferment of Apprentices."

Selective Service regulations were amended by President Truman on June 27 to provide for deferment of "qualified industry apprentices." According to D.T.A., only apprenticeship programs in existence for at least one year, and which are "soundly sponsored and properly certified," will be eligible under this program.

Mechanical Division Circular Letters

Mechanical Lubricators on Interchange Freight Cars

In two circular letters dated September 4, the A.A.R. Mechanical Division announced advance approval of the application of mechanical journal lubricators of both the Hennessy and the Jeffers types to cars which move in interchange freight service, up to 1,000 car sets of each. The letters state that this does not constitute unlimited approval of these devices as now designed, but the action is taken so that service performance data may be secured, properly evaluated and further consideration given to unlimited approval.

For the benefit of car owners contemplating installation of these lubricators and for the information of railroad forces responsible for servicing the cars, the letters included general application and maintenance instructions supplied by the respective manufacturers who may be approached directly for further details as required.

One of the A.A.R. letters listed the numbers of individual cars equipped with journal lubricators supplied by the Hennessy Lubricator Company, Inc., 605 Guilford Avenue, Chambersburg, Pa. These included: Ten B&O express cars; 35 B&O hopper cars; 10 Pennsylvania express cars; 8 Southern box cars; 2 Union Pacific box cars; 3 Erie box cars; and 2 Wilson refrigerator cars.

Jeffers journal lubricators, furnished by the Fullo Corporation, 2608 Eastwood avenue, Chicago 25, were said to be applied to only a limited number of cars to date, but the second letter called attention to arrangements now being made to install

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE SEPTEMBER ISSUE

Diesel-Electric Locomotive Orders

Road	No. of Units	Horse-Power	Service	Builder
Atlanta & West Point & Western of Alabama	21	1,500	General purpose	Electro-Motive
Canadian National	40	1,500	Road	Gen'l Motors Diesel Ltd.
	6	1,200	Road Switch	Gen'l Motors Diesel Ltd.
	22	660	Switching	Montreal Loco. Wks.
	20	1,600	Road	Canadian Loco. Co.
	10	1,600	Road	Montreal Loco. Wks.
	2	1,000	Switchers	Alco-G. E.
	2	1,200		Electro-Motive
Chicago, Rock Island & Pacific	30[2]	1,500	Road switch	Electro-Motive
Colorado & Southern	10[3]	1,500	Switching	Electro-Motive
Detroit, Toledo & Ironton	7[4]	1,500	General purpose	Electro-Motive
Fort Worth & Denver	2	2,250	Passenger	Electro-Motive
	8	1,500	Switching	Electro-Motive
Georgia	2[5]	1,500	General purpose	Electro-Motive
Maine Central	6[6]	1,500	General purpose	Electro-Motive
	2[6]	660	Switching	Alco-G. E.
Minneapolis & St. Louis	2[7]	1,500		Electro-Motive
Western Maryland	14[8]	1,500		Electro-Motive
	2B[8]	1,500		Electro-Motive
	10[8]	1,600	Road switch	Alco-G. E.

Electric Locomotive Orders

Road	No. of locos.	Service	Builder
New York, New Haven & Hartford	10	Passenger	Not reported

Freight-Car Orders

Road	No. of cars	Type of car	Builder
Allied Chem. & Dye Corp., Solvay Process Div.	50	Caboose	Company shops
Baltimore & Ohio	12	40-ton refrigerator	Pacific Car & Fdry.
Bangor & Aroostook	107[9]	70-ton covered hopper	Pullman-Standard
Central of Georgia	25[10]	Gondola	Pullman-Standard
Chicago, Rock Island & Pacific	200	50-ton automobile box	Pullman-Standard
Detroit, Toledo & Ironton	300[11]	Air dump	Baldwin-Lima-Hamilton
Illinois Central	8	50-ton box	American Car & Fdry.
Missouri-Kansas-Texas	500[12]	Insulated	Not reported
New York, New Haven & Hartford	100[13]	70-ton tank	American Car & Fdry.
Southern Pacific	1,000	70-ton flat	Company shops
	800	Gondola	Company shops
	100	50-ton pulpwood flat	Company shops
Texas Mexican	30[14]	70-ton gondola	Pullman-Standard
		570-ton hopper ballast	Pullman-Standard

Passenger-Car Orders

Road	No. of cars	Type of car	Builder
Boston & Maine	3[15]	Rail diesel	Budd Co.
Canadian National	6[16]	Multiple-unit coaches	Canadian Car & Fdry.
	12	Trailer cars	Canadian Car & Fdry.
Illinois Central	6[17]	Sleeping	Pullman-Standard
New York, New Haven & Hartford	100[13]	Electric Multiple-unit	Not reported

[1] For delivery in November. Estimated cost of each unit $151,000.

[2] These GP-7's to cost in excess of four million dollars. Delivery expected in first quarter of 1953.

[3] To be equipped with six-wheel trucks.

[4] For January delivery.

[5] Delivery scheduled for November. Estimated cost $324,000.

[6] Delivery scheduled for late fall.

[7] SD-7 type. Delivery scheduled for December. Cost, $372,000.

[8] Delivery expected during December and January. The 14 1,500-hp. units will be divided into two three-unit 4,500-hp. locomotives and four two-unit 3,000-hp. locomotives.

[9] Delivery expected in March or April 1953. These are in addition to 250 similar units ordered in July as reported in the August issue.

[10] Delivery scheduled for first quarter of 1953. Estimated cost, $178,750.

[11] To have nailable steel flooring. Delivery scheduled for December and January.

[12] Delivery scheduled for April 1953.

[13] The freight cars are for use primarily in shipping potatoes and paper. The passenger cars, to be of stainless-steel construction, will be air conditoned for commuter service.

[14] For delivery in second quarter of 1953. Cost of gondola cars, $199,500; of ballast cars, $39,335.

[15] For delivery late in 1952 or early in 1953. Order consists of two coaches and one combination coach-baggage unit. Approximate cost, $195,000.

[16] To be of lightweight steel and aluminum construction. Multiples of three units—a self-propelled motor coach and two trailer cars—may be used to make up trains of six, nine, 12, 15, or 18 cars. A train of three cars may be controlled from either the motor coach or the last trailer. Cars expected to be in operation before the end of the year.

[17] Delivery expected during third quarter of 1953. To be of a new 11-double bedroom design, with a public washroom and providing additional linen storage space.

Notes: *Colorado & Southern*. The C & S has been authorized to acquire 70 50-ft. and 30 65-ft. mill-type gondola cars and 20 70-ton covered hopper cars.

Fort Worth & Denver. The F W & D has been authorized to acquire 250 40-ft. steel box cars.

more of them in interchange freight service and said that a complete list of the railroads and car numbers involved will be furnished as soon as made available by the manufacturer.

Replacing Old-Style Ball-Check Covers

A circular letter released by the division on September 4, 1952, calls attention to Interchange Rule 60, Sec. 1, Note 6 which requires replacement of the old-style ball-check cover with a new-style cover (Pc. No. 95051 or CV-101) on the emergency portion of AB brakes at the time of periodic attention. The important objective of this change is to minimize air leakage in brake systems in the interest of more effective and safe train braking, and, since the first of this year, the full cost of applying the new style cover has been included in the charge for periodic brake attention, as specified in Rule 111, Items 15 and 15-A.

According to the A.A.R. letter, a check by one railroad, subsequently confirmed by investigations of the Committee on Brakes and Brake Equipment, as well as the Mechanical Inspection Department, revealed that a considerable number of cars on which air brakes received periodic attention since January 1, 1951, still had old-style ball-check covers on the emergency portions. As a matter of fact, the study uncovered 391 of these AB valves with old covers in railroad service stock and 467 in private-car stock; also 13 valves with old covers applied to railroad cars and 17 to private cars. The period covered in the study was from January 1, 1951, to June 30, 1952. The circular letter urges that individual railroads take prompt steps to correct this condition.

Stevens Receives Steam Locomotive Institute Endowment

The dissolution of the Steam Locomotive Research Institute, Inc., and the setting aside of its funds to establish scholarships for the sons of railroad men who made the "iron horse" an exciting symbol of the country's growth were announced at a luncheon at the Uptown Club, New York, on Friday, September 19, when R. P. Johnson, president of the research group, presented a $40,000 check for the scholarship endowment to Jess H. Davis, president of Stevens Institute of Technology, Hoboken, N. J.

The annual income from this fund will "assist one or more deserving sons of railroad men or sons of deceased railroad men" to obtain an engineering education, according to stipulations by the Research Institute. Students will be selected by Stevens and scholarships will be awarded according to individual need and ability. The endowment, Mr. Johnson explained, has been set up in the nature of a memorial to the traditions and accomplishments of the steam locomotive by the institute which has conducted development work for American locomotive builders.

In accepting the gift, Mr. Davis pointed out that among the contributions to the establishment of railroads in this country by the Stevens family, for whom the Stevens

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

Freight Service (Data from I.C.C. M-211 and M-240)

Item No.		Month of May 1952	Month of May 1951	5 months ended with May 1952	5 months ended with May 1951
3	Road locomotive miles (000) (M-211):				
3–05	Total, steam	16,898	25,454	92,389	134,220
3–06	Total, Diesel-electric	27,726	23,105	132,413	105,855
3–07	Total, electric	786	853	3,957	4,126
3–04	Total, locomotive-miles	45,441	49,413	228,826	244,220
4	Car-miles (000,000) (M-211):				
4–03	Loaded, total	1,663	1,774	8,260	8,629
4–06	Empty, total	940	928	4,500	4,297
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6–01	Total in coal-burning steam locomotive trains	30,886	45,023	166,539	229,563
6–02	Total in oil-burning steam locomotive trains	7,616	12,781	40,878	61,279
6–03	Total in Diesel-electric locomotive trains	78,148	65,344	367,801	295,853
6–04	Total in electric locomotive trains	2,245	2,388	11,042	11,328.
6–06	Total in all trains	119,022	125,545	586,561	598,112
10	Averages per train-mile (excluding light trains) (M-211):				
10–01	Locomotive-miles (principal and helper)	1.03	1.04	1.04	1.05
10–02	Loaded freight car-miles	40.00	39.70	39.60	39.30
10–03	Empty freight car-miles	22.60	20.80	21.60	19.50
10–04	Total freight car-miles (excluding caboose)	62.60	60.50	61.20	58.80
10–05	Gross ton-miles (excluding locomotive and tender)	2,863	2,812	2,815	2,723
10–06	Net ton-miles	1,313	1,316	1,303	1,272
12	Net ton-miles per loaded car-mile (M-211)	32.80	33.10	32.90	32.40
13	Car-mile ratios (M-211):				
13–03	Per cent loaded of total freight car-miles	63.90	65.70	64.70	66.80
14	Averages per train hour (M-211):				
14–01	Train miles	17.80	17.30	17.60	16.90
14–02	Gross ton-miles (excluding locomotive and tender)	50,467	47,928	48,824	45,403
14	Car-miles per freight car day (M-240):				
14–01	Serviceable	45.30	46.50	45.20	46.00
14–02	All	43.00	44.40	43.00	44.00
15	Average net ton-miles per freight car-day (M-240)	110.20	113.10	110.20	112.20
17	Per cent of home cars of total freight cars on the line (M-240)	45.60	39.20	42.70	36.10

Passenger Service (Data from I.C.C. M-213)

Item No.		Month of May 1952	Month of May 1951	5 months ended with May 1952	5 months ended with May 1951
3	Road motive-power miles				
3–05	Steam	6,826	9,989	37,643	54,525
3–06	Diesel-electric	18,731	16,504	90,455	78,556
3–07	Electric	1,624	1,632	8,222	8,083
3–04	Total	27,181	28,124	136,327	141,164
4	Passenger-train car-miles:				
4–08	Total in all locomotive-propelled trains	270,826	270,704	1,353,885	1,360,916
4–09	Total in coal-burning steam locomotive trains	34,321	51,857	198,331	287,447
4–10	Total in oil-burning steam locomotive trains	26,832	32,024	130,230	166,383
4–11	Total in Diesel-electric locomotive trains	191,745	169,495	933,770	820,796
12	Total car-miles per train-miles	9.72	9.41	9.74	9.49

Yard Service (Data from I.C.C. M-213)

Item No.		Month of May 1952	Month of May 1951	5 months ended with May 1952	5 months ended with May 1951
1	Freight yard switching locomotive-hours (000):				
1–01	Steam, coal-burning	853	1,218	4,544	6,524
1–02	Steam, oil-burning	163	244	846	1,231
1–03	Diesel-electric[1]	3,188	2,986	15,790	14,430
1–06	Total	4,200	4,473	21,299	22,317
2	Passenger yard switching hours (000):				
2–01	Steam, coal-burning	26	48	158	258
2–02	Steam, oil-burning	11	12	58	66
2–03	Diesel-electric[1]	258	244	1,280	1,196
2–06	Total	328	338	1,664	1,689
3	Hours per yard locomotive-day:				
3–01	Steam	6.80	7.60	7.20	8.10
3–02	Diesel-electric	16.20	17.30	16.70	17.60
3–05	Serviceable	14.10	14.20	14.50	14.50
3–06	All locomotives (serviceable, unserviceable and stored)	12.30	12.20	12.60	12.60
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.74	1.74	1.78	1.78
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.75	0.78	0.76	0.77

[1] Excludes B and trailing A units.

SUMMARY OF MONTHLY HOT BOX REPORTS

Month	Foreign and system freight car mileage (total)	Cars set off between division terminals account hot boxes: System	Foreign	Total	Miles per hot box car set off between division terminals
July, 1950	2,745,932,894	.....	.....	23,957	114,619
August, 1950	2,937,455,020	7,422	15,490	22,912	128,206
September, 1950	2,974,297,739	6,541	12,881	19,422	153,141
October, 1950	3,165,997,915	4,343	8,935	13,278	238,439
November, 1950	2,868,871,913	2,536	5,331	7,867	364,672
December, 1950	2,813,042,212	2,278	5,968	8,246	341,140
January, 1951	2,840,847,511	2,870	8,436	11,306	251,269
February, 1951	2,425,226,454	4,528	14,063	18,591	130,452
March, 1951	3,063,173,942	3,667	10,078	13,745	222,857
April, 1951	2,996,562,763	3,702	8,914	12,616	237,521
May, 1951	3,013,634,782	5,631	13,737	19,368	155,599
June, 1951	2,874,873,495	7,074	15,376	22,450	128,057
July, 1951	2,768,920,095	8,886	18,823	27,709	99,929
August, 1951	3,009,371,111	9,023	19,092	28,115	107,038
September, 1951	2,925,570,545	6,472	13,565	20,037	146,008
October, 1951	3,116,490,095	4,131	9,053	13,184	236,384
November, 1951	2,939,503,144	2,022	4,405	6,427	457,368
December, 1951	2,752,316,133	2,130	5,398	7,528	365,611
January, 1952	2,824,298,630	3,208	7,197	10,405	271,437
February, 1952	2,809,162,671	2,723	6,473	9,196	305,477
March, 1952	2,943,812,727	2,594	5,877	8,471	347,517
April, 1952	2,766,313,714	3,826	7,759	11,585	238,784
May, 1952	2,918,508,445	6,020	10,938	16,958	172,102

Institute of Technology is named, were the first steam locomotive, the first charter for a railroad, the wooden railroad tie, the T-shape rail and the "hook-headed" railroad spike to hold them together. The latter inventions, slightly modified, are still in use.

Franklin Receives A.A.R. Research Contract

To investigate materials used in freight-car-axle bearings, the Association of American Railroads has awarded a two-year contract to the Franklin Institute Laboratories for Research and Development, according to Dr. Nichol H. Smith, director of the laboratories. The project will be under the direct supervision of F. S. Chaplin, associate director in charge of mechanical engineering.

The research program will give special emphasis to obtaining the bearing material with the lowest friction through an investigation of the differences in the frictional properties of various materials, particularly when not sufficiently lubricated. A special machine will be developed by the laboratories to permit controlled tests under the desired combination of pressure, speed, temperature and oil supply.

The initial work will be concerned with the investigation of existing materials, but later on special materials may be developed.

The emphasis of the program on friction, according to Mr. Chaplin, is indicated by the increase in the occurrence of hot boxes on railways during hot weather. This suggests the possibility that a relatively small decrease in the temperature rise due to friction might result in a drastic reduction in the number of hot boxes.

Gas Turbine Undergoing Test on C.&N.W.

The 4,000-hp. Westinghouse-Baldwin gas turbine locomotive, which recently completed a series of tests on the Missouri-Kansas-Texas, is currently undergoing a 90-day service test on the Chicago & North Western. The single-unit locomotive has been assigned to passenger service between Chicago and Elroy, Wis.,—205 miles—handling the "Duluth-Superior Limited" westbound and the "Rochester-Minnesota Special" eastbound.

The test is being conducted in cooperation with the locomotive's builders—Westinghouse Electric Corporation and Baldwin-Lima-Hamilton Corporation.

The gas turbine locomotive on the Missouri-Kansas-Texas gave what Katy officers describe as "very satisfactory results." Between April 18 and July 1, the 4,000-hp. locomotive rolled up a total of 26,000 miles handling Trains 6 and 7 between Parsons, Kan., and Denison, Tex. Upon completion of the tests it was given a detailed inspection at the Parsons shops prior to taking on another assignment elsewhere. Of particular interest to Baldwin and Westinghouse engineers was the locomotive's operation in

(Continued on p. 112)

(Continued from p. 108)

high, ambient temperatures of 'hog back" running through the states of Kansas, Oklahoma and Texas.

British Railways Test Three-Car Diesel Train

A NEW British-built diesel train, designed to achieve economies on branch lines and some main lines, has begun experimental service out of London, as part of the British Railways, study of the possibility of using lightweight units for passenger traffic.

The train is similar to a bus in many ways. The driver sits at the front in full view of the passengers, operating only the main power and brake controls. The mass produced power unit is the same as those used in the latest London suburban buses. It gives a maximum speed of 48 m.p.h. and a cruising speed of 45.

The three-car train has two motor cars and an engineless trailer between, with a total capacity of 129 passengers and an unloaded weight of nearly 40 tons. It can be driven from either end, and in slack periods the trailer can be omitted, thus reducing weight. Maintenance costs are said to be low; fuel consumption is reportedly 5½ miles per gallon.

SUPPLY TRADE NOTES

WESTINGHOUSE ELECTRIC CORPORATION.—*Lee C. Bennett* has been appointed middle Atlantic district transportation manager of the Westinghouse Electric Corporation. Mr. Bennett, who will retain his position as manager, marine and aviation departments, succeeds *L. A. Hester.*

◆

BALDWIN-LIMA-HAMILTON CORPORATION. —*Lewis A. Hester* has been appointed manager, locomotive sales, for the Baldwin-Lima-Hamilton Corporation, with headquarters at Eddystone, Pa.

Mr. Hester began his career as an electrical inspector with the Norfolk & Western. He joined the Westinghouse Electric Corporation in 1923 as a member of the graduate student course and later, worked succesively as railway application engineer; railway commercial engineer; and manager, transportation sales department. In 1946 he was appointed manager of the transportation department for the Middle Atlantic district, the position he held before becoming associated with Baldwin.

Lewis A. Hester

◆

SAMUEL MOORE & CO.—Samuel Moore & Co., Mantua, Ohio, has formed a new wholly owned subsidiary, the *Samuel Moore Seating Company,* which is acquiring the plant and business of *Tru-Car, Inc.,* of Kent, Ohio. Sales and service of Tru-Car seats to transportation industries will be handled by the Transit Products division of Samuel Moore & Co. Officers of the new company are *Samuel D. Moore,* president, and *Frank H. Olton,* vice-president. Operations in the Kent plant will continue under direction of *G. J. Diener,* shop superintendent.

◆

RAILROAD SUPPLY & EQUIPMENT, INC.—*C. D. Allen,* owner of the Allen-Calleri Corporation, has been appointed representative of Railroad Supply & Equipment, Inc., for the West Coast area.

C. D. Allen

◆

UNION ASBESTOS & RUBBER CO.—*Emil T. Johnson* has been appointed director, production and engineering, of the Fibrous products division of the Union Asbestos & Rubber Company, Chicago.

◆

DETREX CORPORATION. *L. Camel* has been appointed divisional general sales manager of the Industrial Chemical Division, and *D. E. Williard,* divisional general sales manager of the Industrial Equipment Division of the Detrex Corporation. Mr. Camel will direct the sale and service of the Chemical Division products. Mr. Williard will control the sales and service of solvent degreasing machines and solvents, and the mechanical washers used in industrial production cleaning.

◆

GENERAL AMERICAN TRANSPORTATION CORPORATION.—*R. W. Thompson,* chief engineer of the General American Transportation Corporation, Chicago, has retired after more than 34 years of service with the company.

BARCO MANUFACTURING COMPANY.—The Barco Manufacturing Company is constructing a new plant at 500-530 North Hough street, Barrington, Ill., for occupancy early in 1953. The new structure will provide 103,000 sq. ft. of floor space for officers, manufacturing, and other facilities, including a cafeteria for employees.

◆

GUSTIN-BACON MANUFACTURING COMPANY.—*Edward A. McCabe* has been appointed manager of the New York division of Gustin-Bacon. Mr. McCabe, who will be in charge of all glass fiber insulation, industrial and railroad division sales in New England, New York, New Jersey, Pennsylvania and Delaware, joined the firm in 1942. Previously he had been special engineer in the office of the executive vice-president of the New York Central System.

Edward A. McCabe

◆

AMERICAN LOCOMOTIVE COMPANY.—*George Y. Taylor* has been appointed director of personnel for the diesel locomotive and ordnance divisions of the American Locomotive Company at Schenectady and Auburn, N. Y. Mr. Taylor became associated with the company as director of education in September 1946. The Alco-GE diesel-electric locomotive school was organized under his direction.

◆

TWINSBURG-MILLER CORPORATION.—The Twinsburg-Miller Corporation, Twinsburg, Ohio, have appointed the *Spring Packing*

(Continued on p. 116)

(Continued from p. 112)

Corporation, Chicago, as distributor of Glasfab for the railroad industry. *W. H. Russell,* vice-president of Spring Packing, will be in charge of the promotion and sale of the product.

◆

Lord Manufacturing Company. — *George E. Tubb,* general sales manager of the Lord Manufacturing Company has been appointed vice-president in charge of sales, and *Richard C. Henshaw,* manager of product and sales engineering, has been appointed manager of engineering.

G. E. Tubb

Mr. Tubb, a graduate of the University of Texas, served five years with the Weyerhauser Timber Company in the State of Washington, and was manager of the Order and Contract Division of the Wright Aeronautical Corporation at Woodridge, N. J., immediately prior to his association with the Lord organization early in 1949.

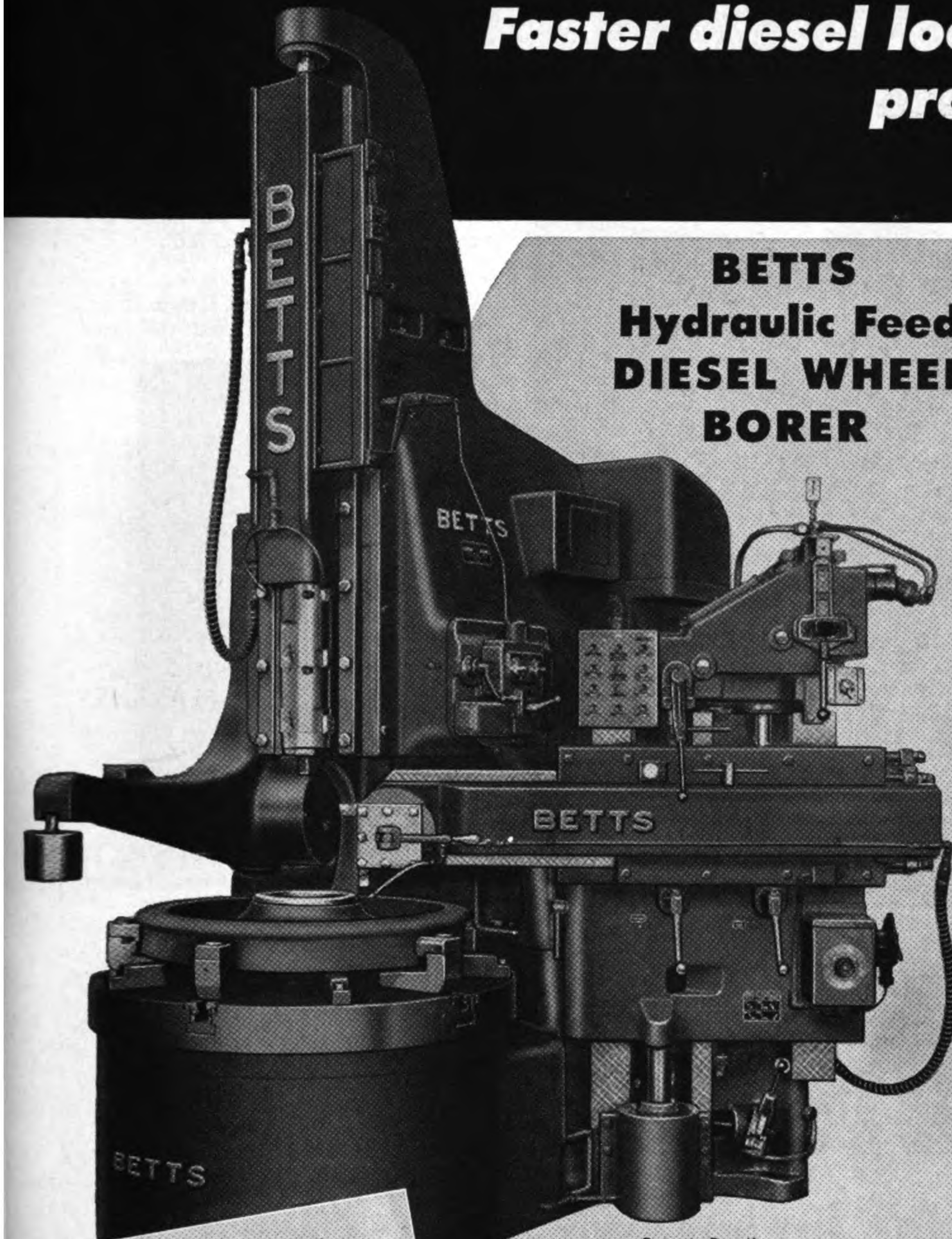
R. G. Henshaw

Mr. Henshaw was born in Butler, Pa. He is a graduate of the University of Pittsburgh, School of Mechanical Engineering. He became associated with the Lord company as an engineer in 1938. He assumed the duties of chief of product engineering in 1944, and became manager of product and sales engineering in 1949.

◆

Acme Steel Company.—*Howard H. Gamble* has been appointed special representative at Los Angeles for the Acme Steel Products Division of the Acme Steel Company, Chicago. *Ray D. Vilas* replaces

Faster diesel locomotive wheel production at less cost



BETTS Hydraulic Feed DIESEL WHEEL BORER

- Full automatic boring cycle, from loaded start to stop, with supplementary manual operation at any point in the cycle.
- Wide speed range for use of both high speed steel and carbide tools, with automatic speed reduction for combination carbide roughing and high speed steel finishing.
- Sidehead with hydraulic feed and rapid traverse through single lever control. Supplementary manual control for set-up and checking.
- Special five jaw automatic chuck designed to handle wheels either side up.
- Automatic brake stops table before spindle traverses upward.
- Boring sizes up to 12″ diameter. Wheel tread diameters up to 48″.
- Square-type ram with adjustable gibs on each side for maintaining closer, constant accuracy. Hydraulic cylinder in line with boring ram.

Patents Pending

Long service life with low maintenance cost

Among Railroad Tools built by Consolidated are . . .

CAR WHEEL BORERS
DIESEL WHEEL BORERS
BURNISHING LATHES
TIRE MILLS
END DRIVE AXLE LATHES
CENTER DRIVE AXLE LATHES
JOURNAL TRUING LATHES
DRIVING WHEEL LATHES
CAR WHEEL LATHES
RADIUS LINK GRINDERS
PROFILE MILLING MACHINES
SLAB MILLING MACHINES
ROD MILLING MACHINES
CYLINDER BORING MACHINES
KEYWAY MILLING MACHINES
CRANK PLANERS
DRILL PRESSES
AND OTHERS

Bores diesel locomotive wheels up to 48″ tread diameter, and passenger or freight car wheels down to 30″ tread diameter. Hydraulically operated sidehead, for improved hub turning and facing, has feed and rapid traverse vertically and horizontally. Other advanced features of this modern machine contribute to faster wheel production at lower cost. Full information will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOL CORPORATIO[N]

(Continued from p. 112)

Corporation, Chicago, as distributor of Glasfab for the railroad industry. *W. H. Russell*, vice-president of Spring Packing, will be in charge of the promotion and sale of the product.

◆

LORD MANUFACTURING COMPANY. — *George E. Tubb*, general sales manager of the Lord Manufacturing Company has been appointed vice-president in charge of sales, and *Richard C. Henshaw*, manager of product and sales engineering, has been appointed manager of engineering.

G. E. Tubb

Mr. Tubb, a graduate of the University of Texas, served five years with the Weyerhauser Timber Company in the State of Washington, and was manager of the Order and Contract Division of the Wright Aeronautical Corporation at Woodridge, N. J., immediately prior to his association with the Lord organization early in 1949.

R. G. Henshaw

Mr. Henshaw was born in Butler, Pa. He is a graduate of the University of Pittsburgh, School of Mechanical Engineering. He became associated with the Lord company as an engineer in 1938. He assumed the duties of chief of product engineering in 1944, and became manager of product and sales engineering in 1949.

◆

ACME STEEL COMPANY.—*Howard H. Gamble* has been appointed special representative at Los Angeles for the Acme Steel Products Division of the Acme Steel Company, Chicago. *Ray D. Vilas* replaces

Mr. Gamble as sales representative at Los Angeles. *E. J. McGraw,* sales representative, has been transferred from the Pacific Northwest to the San Francisco district, and *Arthur B. Hall* has been transferred from South Central California to San Francisco. *J. P. Brehm* has been appointed sales representative to replace Mr. Hall.

◆

General Steel Castings Corporation.—*W. C. Krautheim* has been appointed

W. C. Krautheim

chief mechanical engineer, and *R. E. Peters,* assistant chief mechanical engineer at Eddystone, Pa.

R. E. Peters

Since joining the company in 1917, Mr. Krautheim has served as assistant engineer, as assistant mechanical engineer, and as mechanical engineer since 1944.

◆

Pittsburgh Plate Glass Company.—*Richard P. Bell,* for the past six years paint sales manager at the Pittsburgh warehouse of the Pittsburgh Plate Glass Company, has been appointed assistant general paint manager of the firm's merchandising division.

◆

Wrought Steel Wheel Industry.—The Technical Board of the Wrought Steel Wheel Industry has moved to new quarters at 230 North Michigan avenue, Chicago 1.

◆

McKay Company.—*Thomas S. Collins,* formerly with the Industrial Tape Corporation, has been appointed electrode repre-

(Continued on p. 125)

(Continued from p. 118)

sentative for the Chicago territory of the McKay Company, Pittsburgh. Mr. Collins will maintain headquarters at 1500 South Western avenue, Chicago, and his territory will cover northeastern Illinois and northwestern Indiana.

◆

SAFETY CAR HEATING & LIGHTING CO.—*Harry W. Jones*, sales representative for the Safety Car Heating & Lighting Co. at Philadelphia, has been moved to the main sales

H. W. Jones

division at New Haven, Conn. *Hubert Medland*, sales representative at the Chicago office, has been transferred to Philadelphia to succeed Mr. Jones. *Gerald C. Beck* has

G. C. Beck

been appointed sales representative at Chicago. Mr. Beck formerly was supervisor of air conditioning and lighting with the Pullman Company.

◆

INLAND STEEL COMPANY.—*Albert W. McAbee* has been appointed assistant manager of sales in the railroad, pig iron and chemical division of the Inland Steel Company, to succeed *Leon C. Reed*, who has retired.

Mr. Reed, who joined Inland in 1909, worked his way up through several positions in the sales department to become

the first manager of the newly established Chicago district sales office in 1936. In 1944 he was appointed assistant manager of sales.

Prior to joining Inland in 1948, Mr. McAbee had been in the sales department of U.S. Steel in Pittsburgh and Chicago.

◆

Magor Car Corporation.—*James W. Leis*, vice-president in charge of operations of the Magor Car Corporation, has retired after 42 years of service, but will remain as a member of the board of directors. *E. O. Lunde*, formerly chief engineer, has been appointed works manager.

Pullman Company.—*George W. Bohannon*, manager of purchases and stores for the Pullman Company, has been appointed general manager, with headquarters remaining at Chicago. Prior to joining Pullman in October 1951, Mr. Bohannon was chief mechanical officer for the Chicago & North Western system.

◆

Sherwin-Williams Company. *R. H. Hill* has been appointed assistant general manager of transportation sales for Sherwin-Williams. Mr. Hill, who will headquarter in Cleveland, will supervise transportation sales activities during the absence of *C. B. Bull*, manager, who is convalescing from a protracted illness. Mr. Hill will continue also to serve as manager of the Atlantic Coast transportation zone.

R. H. Hill

Mr. Hill joined Sherwin-Williams in 1917 and has had wide experience in the marine, railroad and other transportation fields. He is a member of the New York Railroad Club and of other transportation organizations.

◆

Westinghouse Air Brake Company.—The Westinghouse Air Brake Company has announced formation of a research laboratory to serve all divisions of the company and its subsidiary and affiliated companies, including European companies in the Westinghouse group. *Thomas Meloy*, president of Melpar, Inc., Alexandria, Va., a subsidiary, has been appointed director of research for Westinghouse and chairman of a research and development committee representing the various divisions.

Thomas Meloy

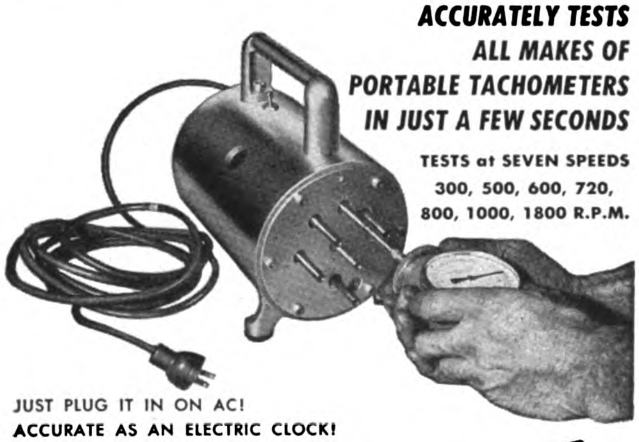
◆

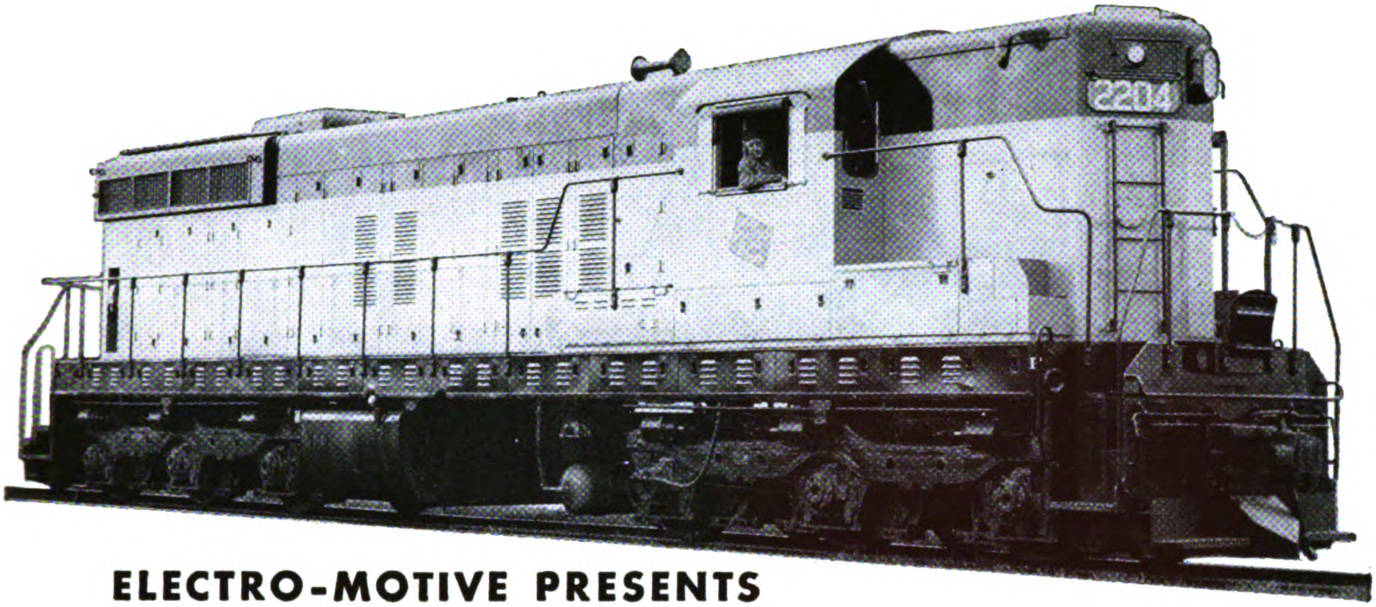
American Chemical Paint Company.—The American Chemical Paint Company has acquired and is operating office and plant facilities at Niles, Calif.

◆

Buckeye Steel Castings Company.—*Robert J. Wylie* has joined the sales staff of the Buckeye Steel Castings Company. Mr. Wylie has been in the railway supply business in St. Paul, Minn., for many years.

(Continued on p. 130)





ELECTRO-MOTIVE PRESENTS

THE **SD7** SIX-MOTOR ROAD SWITCHER—

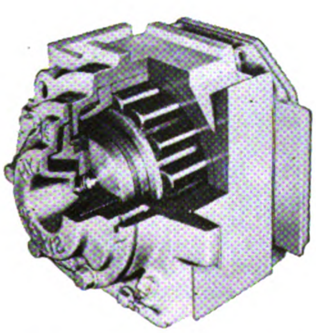
HYATT-EQUIPPED

A six-motor, six-axle, heavy-duty road switcher—the SD7 is the first locomotive of its type to use the new Flexi-Coil truck equipped with Hyatt Roller Bearings.

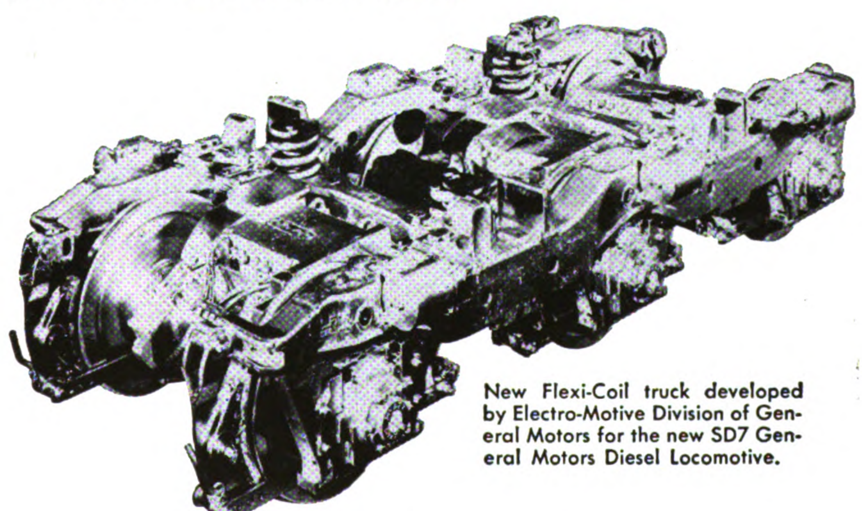
This new Electro-Motive development in switcher truck design embodies an entirely new principle in springing and permits riding quality comparable to the finest passenger locomotive.

High capacity straight radial Hyatt Roller Bearings, with resilient thrust blocks to cushion sidewise shocks make Hyatt Roller Bearing Journal Boxes the ideal choice for this new Flexi-Coil truck.

And too, the six motors in the new SD7 General Motors Diesel Locomotive are equipped with dependable Hyatt Traction Motor Armature Bearings. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.



Hyatt Roller Bearing Journal Box with resilient thrust unit as used on the GM Diesel Locomotives.



New Flexi-Coil truck developed by Electro-Motive Division of General Motors for the new SD7 General Motors Diesel Locomotive.

HYATT ROLLER BEARING JOURNAL BOXES

(*Continued from p. 126*)

General Motors Corporation.—*R. L. Terrell* has been appointed manager of plant No. 3 of the Electro-Motive Division of the General Motors Corporation at Cleveland, Ohio, to succeed *A. G. Finigan*, who will retire in 1953 and who has been transferred to the staff of the works manager of the division at LaGrange, Ill. Mr. Terrell was formerly manager of the Southeastern region, with headquarters at Jacksonville, Fla.

A. O. Myers and *B. K. Wingerter* have been appointed, respectively, regional manager and district sales manager of the southeastern region of the *Electro-Motive Division* of General Motors Corporation at Jacksonville, Fla. Mr. Myers succeeds *R. L. Terrell.*

Plans for trebling the size of the Jacksonville, Fla., branch of the *Electro-Motive Division* of General Motors have been announced by N. C. Dezendorf, vice-president of General Motors and general manager of the Division at headquarters at LaGrange. The branch rebuilds major components of Diesel locomotives such as generators, traction motors, and Diesel engines, and is also a replacement parts distribution point. The present Jacksonville plant occupies 26,880 sq. ft. of floor space. This will be enlarged to 77,568 sq. ft. The new addition will be roughly in the form of a U built around the present plant, with a modern office wing stretching across the front. The Southeastern Regional offices of Electro-Motive Division, recently moved from Washington, D. C., to Jacksonville and

R. L. Terrell

now housed in the Atlantic National Bank Building Annex will be located in the new office building at the plant. Plans call for completion of the construction next spring.

◆

Thomas A. Edison, Inc.—*Wallace M. Schleicher* has been appointed general sales manager of the Edison storage battery division of Thomas A. Edison, Inc.

Mr. Schleicher, who holds an engineering degree from Lehigh University, this

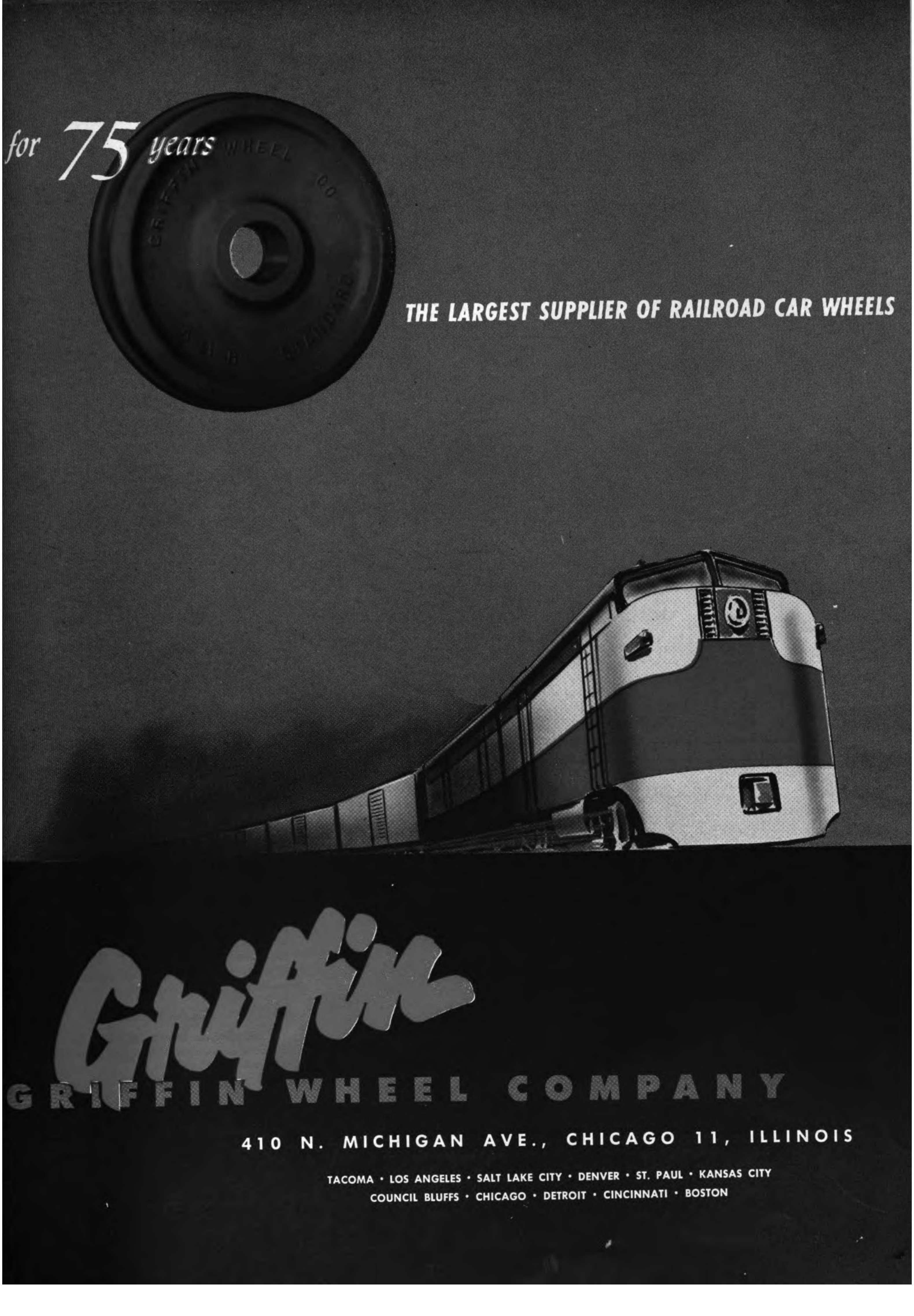
Wallace M. Schleicher

year completed 25 years of continuous service with the company. He joined the sales engineering department in March 1927 and was appointed section head in 1930, sales engineer in 1939 and commercial engineer in 1944. As commercial engineer, he has been responsible both for application and service engineering and associated sales activities.

◆

United States Steel Company.—*Fred H. Lucas* has been appointed manager of structural and plate sales of the United States Steel Company, succeeding *A. H. Warren, Jr.*, who has retired after 43 years of service with the company.

Mr. Lucas joined U.S. Steel as an apprentice in the Ambridge, Pa., plant of the American Bridge Company in 1909. He joined the Carnegie Steel Company in 1930



for 75 years
THE LARGEST SUPPLIER OF RAILROAD CAR WHEELS
Griffin
GRIFFIN WHEEL COMPANY
410 N. MICHIGAN AVE., CHICAGO 11, ILLINOIS
TACOMA • LOS ANGELES • SALT LAKE CITY • DENVER • ST. PAUL • KANSAS CITY
COUNCIL BLUFFS • CHICAGO • DETROIT • CINCINNATI • BOSTON

as a structural engineer, became manager of sales in the structural and plate division at Chicago in 1936, and assistant manager of sales in the Pittsburgh office in 1947.

J. P. D. Gerrese has been appointed chief engineer of the *National Tube Division* of the United States Steel Company, at Gary, Ind.

◆

YALE & TOWNE MANUFACTURING CO.—*John I. Somers*, formerly assistant manager of the hoist department of the Yale & Towne Manufacturing Co., has been appointed sales manager for Worksaver electrically operated hand lift trucks. *T. F. Moriarty*, has been appointed sales manager for manually operated hand lift trucks.

Obituary

FRED W. ALGER, assistant vice-president of the Pullman-Standard Car Manufacturing Company, died at his home in Chicago on August 3. Mr. Alger began his carbuilding career in the shops of the American Car & Foundry Co. at Detroit in 1923, later transferring to A.C.F.'s sales department in New York. Subsequently he became associated with the Standard Steel Car Company as sales agent, then joined Pullman-Standard in 1930 when Standard Steel was acquired by the Pullman group of companies. In May of this year he was transferred to the Birmingham sales office, but had been unable to take up his new duties because of illness.

PERSONAL MENTION

Atlantic Coast Line

DAVID H. NOBEL appointed traveling electrical foreman at Wilmington, N. C.

Boston & Maine

W. H. CHAPLIN, assistant to superintendent of locomotive maintenance, appointed assistant general diesel foreman at Boston Diesel Terminal.

RAYMOND F. MCCAFFREY, foreman at Charlestown (Mass.) terminals, appointed assistant to superintendent of locomotive maintenance at Boston.

M. A. THOMPSON appointed supervisor of welding

Canadian National

V. R. SPEARE, master mechanic on the Edson division, appointed master mechanic on Hudson Bay division.

Chesapeake & Ohio

O. R. LAMB, road foreman of engines, Piedmont-Washington subdivision, has retired.

FLOYD R. JAHNKE appointed car foreman at Cheviot, Ohio.

(*Continued on p. 138*)

(Continued from p. 132)

F. E. LAWRENCE, assistant road foreman of engines, appointed road foreman of engines, Piedmont-Washington subdivision, with headquarters at Charlottesville, Va.

M. E. SANDRIDGE appointed assistant road foreman of engines, with headquarters at Charlottesville, Va.

Chicago & North Western

R. C. GAETH appointed acting electrical supervisor at Chicago.

H. F. HINSEY, electrical supervisor at Chicago, has been granted a leave of absence because of illness.

Chicago, Burlington & Quincy

D. F. CARTER, assistant electrical engineer—equipment, appointed electrical engineer—equipment, at Chicago.

F. W. DUNNING appointed engineer of tests at Aurora, Ill.

J. E. GARDNER, electrical engineer—equipment at Chicago, has retired.

New York, New Haven & Hartford

WILLIAM J. HARLOW, assistant general mechanical superintendent, appointed general mechanical superintendent at New Haven.

Career: Entered the service of the New Haven in 1923 as an electrical helper at the Dover Street enginehouse, Boston. Subsequently served as electrician, night foreman, shop foreman and general foreman

William J. Harlow

before going to New Haven in 1947 as assistant master mechanic. In 1948 appointed general foreman of the new diesel-electric shop at New Haven; in 1950, promoted to assistant superintendent of locomotive maintenance, and in 1951 assistant general mechanical superintendent.

Chicago, Milwaukee, St. Paul & Pacific

A. G. HOPPE, engineer of research and development, appointed mechanical engineer at Milwaukee. Office of engineer of research and development abolished.

H. H. MELZER, assistant mechanical en-

gineer, appointed chief engineer of tests, with headquarters at Milwaukee.

D. C. SHEFFIELD appointed engineer of tests (diesel), with headquarters at Milwaukee.

G. H. KOESTER appointed assistant to superintendent of motive power, with headquarters at Milwaukee.

Chicago, Rock Island & Pacific

F. R. HOSACK, general superintendent motive power at Chicago, appointed general superintendent car department, and F. J. SCHLEIHS, master mechanic at Des Moines, Ia., appointed general superintendent for motive power at Chicago. These appointments were announced in the August issue but were incorrectly placed under another railroad.

Norfolk Southern

M. B. DOWDY, assistant to chief mechanical officer, appointed assistant chief mechanical officer, with headquarters at Norfolk, Va.

Born: January 6, 1917.

Career: Began career with Norfolk Southern as a carman apprentice on March 17, 1936. Upon completion of apprentice-

M. B. Dowdy

ship on June 26, 1940, became air brake mechanic. On January 1, 1944, appointed chief mechanical inspector, and on June 1, 1948, assistant to chief mechanical officer, which position has now been abolished.

New York Central

H. R. MCILVEEN appointed general diesel supervisor, locomotive maintenance, at New York.

W. C. SHIFFER appointed general foreman, Root Street coach yard, Chicago.

E. P. Moyer appointed special inspector, with headquarters at Chicago.

CARL J. GUSTAVSON appointed general foreman, 61st Street, Englewood, Ill.

Michigan Central

R. S. GATES, assistant master mechanic, appointed master mechanic at Jackson, Mich.

C. R. HEMING, master mechanic at Jackson, Mich., has retired.

Minneapolis, St. Paul & Sault Ste. Marie

F. JOHNSON, traveling engineer, appointed master mechanic at Minneapolis.

G. S. STANTON, master mechanic at Minneapolis, has retired.

Pennsylvania

R. C. JOHNSTON, assistant master mechanic, Pittsburgh and Conemaugh divisions, appointed master mechanic, Chicago division.

J. M. LOY, assistant foreman, office of chief of motive power, Philadelphia, appointed general electrician, office of general superintendent of motive power, Central Region, Pittsburgh.

C. W. GARMON, foreman car shop, Toledo, appointed foreman car repairs, Pitcairn, Pa., Pittsburgh division.

D. J. PROKOP, assistant foreman, C. T. Yard, Conway, Pa., appointed foreman car shop, Toledo, Eastern division.

J. M. CARPENTER, assistant master mechanic, Maryland-Delmarva divisions, appointed assistant master mechanic, Pittsburgh-Conemaugh divisions.

D. M. PECK, assistant engineer-motive power, office of electrical engineer, Philadelphia, appointed assistant master mechanic, Northern division.

PERSONAL MENTION

Obituaries

JOHN A. RABUCK, retired mechanical engineer of the Louisville & Nashville at South Louisville, Ky., died on July 7.

PAUL H. SMITH, engineer of tests of the Chicago, Burlington & Quincy at Aurora, Ill., died suddenly of a heart attack at his home on August 17.

New Devices

(*Continued from page 104*)

Black Asphalt Undercoating

The coating, a sprayable material called EC 1189, is designed to protect underbody parts of transportation equipment from corrosion, abrasion and for sound deadening.

For corrosion and abrasion control, it can be used to protect the exteriors of storage tanks, tank trucks, and railroad cars against spillage and water and soil. It will also protect the exteriors of railroad signal bungalows and the bottoms of outdoor switchgear housings.

For sound deadening, the formulation can be used on the interior panels of trucks and railroad cars.

Made by the Minnesota Mining and Manufacturing Co., Detroit 2, it will adhere to most materials and surfaces. When sprayed or brushed to a 1/8 in. thickness, it dries in about 48 hr. to form a tough, rubbery surface.

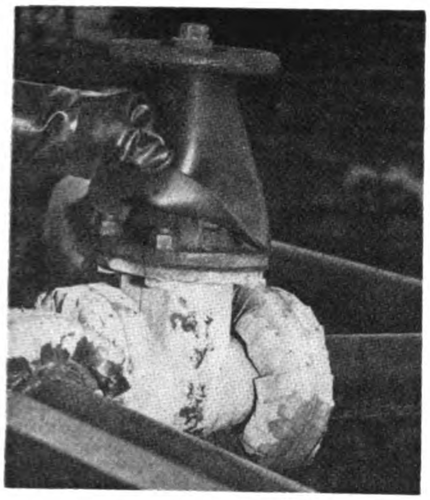
◆

Synthetic Rubber Valve Shield

For use on valves handling acids and other hazardous chemicals, the shield protects the operator from injury if the valve stem packing should fail. It cups the stem and the packing gland and prevents acid from spraying.

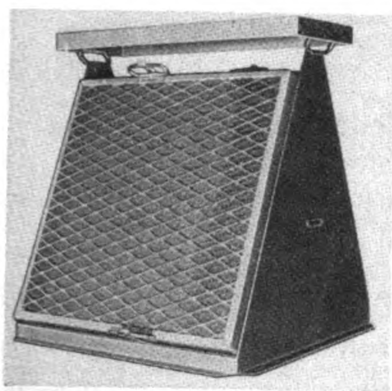
The shield is flexible and is molded in the shape of a flower pot. Where necessary, the edge of the skirt can be trimmed to suit the contour of the valve body. It can be turned back to inspect the valve or to tighten the packing gland nuts.

Originated in a du Pont chemical plant,



the shields called Chex-Spray are manufactured by Industrial Products Company, Philadelphia 33. They are available in three sizes, accommodating valve sizes from ¾ to 4 in.

◆



Grease Eliminator

Prevents accumulation of grease or lint in duct systems, protects motor and blower equipment, reduces maintenance costs and is said to provide better ventilation.

This unit, manufactured by the Farr Company, Los Angeles 45, was designed for installation in kitchen ventilating systems where exhaust ducts present a fire hazard. It is available in a wide variety of sizes and finishes to match existing equipment.

A tray which catches dripping grease that has been accumulated by the filters is suspended below the unit. Filters are quickly removed and snapped back into place and may be cleaned simply by flushing under a hot water tap.

◆

Plexiglas Reflectors

An injection molded Plexiglas material with 2900 optical lenses per sq. in. has been introduced for all types of signs requiring night legibility.

Named Reflexite by its manufacturer the Reflexite Corporation, New York 5, the material is considered suitable for railroads as it is said to be resistant to weather deterioration, corrosion due to sulphuric acid and fractures from flying stones.

The product can be used for the following categories of railroad signs: speed control boards; stop signs; multiple track, mile post and whistle post signs; and reflectorization of non-electrified cabooses.

◆

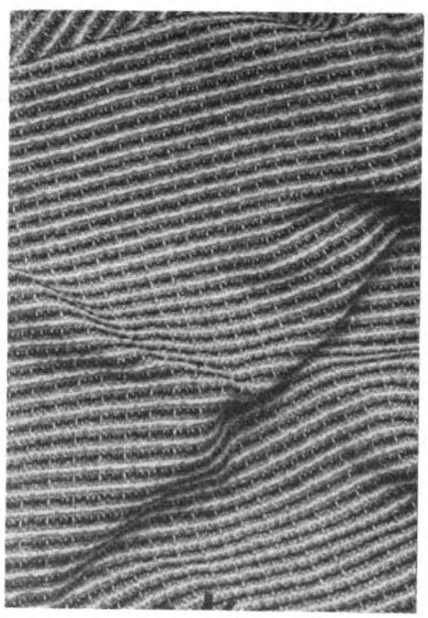
Cold Process Galvanizing Compound

A method of cold galvanizing for surface protection of steel and iron has been announced by the Galvanite Corp., New York 1. The process, which utilizes "Galvanite" is not a paint, but a cold galvanizing compound. It may be applied with any ordinary paint brush, electric spray gun or by cold dip.

Iron or steel surfaces coated with the Galvanite create an electro-chemical union, thereby uniting the zinc with the base metal's surface. It offers cathodic protection and leaves a coating of 96 parts, by weight of pure zinc.

The product can be applied directly to the object, regardless of size. A single coating will give a coverage of approximately 625 sq. ft. per gal. Within 40 min. after application, it will be tack-free and will dry for use, within 48 hr.

◆



Fireproof Drapery Material

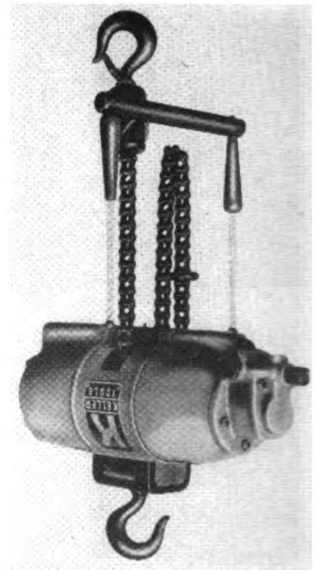
A synthetic fiber, permanently fireproof drapery material having the appearance and feel of wool is now being marketed under the name Infinity Fireproof Fabrics. They are recommended wherever fire codes must be considered.

Introduced by Edwin Raphael Co., Inc., Chicago 10, the fabrics are woven as a full spun Saran-face material. They are said to be mildewproof, mothproof, have

dimensional stability, dry rapidly and need no ironing.

These fabrics have been woven in weights suitable for usage as a flat surface material for printing, textured casement drapery and heavier weights in solid or patterned weaves.

◆



Redesigned Pneumatic Hoist

Experience with their line of air hoists has led to many improvements in design and construction. These lightweight units (a 1,000-lb. capacity hoist weighs 30 lb.) are made by the Keller Tool Company, Grand Haven, Mich.

Features now regularly incorporated include: safety hooks that are standard for the load hook and optional for the suspension hook and and improved lubrication system.

The brake has been redesigned for more positive operation and an extra bearing has been added to the motor drive shaft. In addition, the control lever is made heavier for rough usage and ring gears are hardened for longer wear. Pendent controls for handling unwieldy loads and accessories for operating convenience have been made available at extra cost.

◆

Blind Assembly Clinch Nut

Recommended applications are for blind assemblies or to furnish additional threading depth for application of bolts in thin metals. Product of the Grip Nut Company, Chicago 4, the nut is round with a hexagon-shaped pilot which fits into a hexagon-shaped hole in the metal to which it is being applied. This pilot is then pressed down and flattened out, clinching the nut securely.

The nuts can be used on aluminum, brass or other metals which cannot be projection welded and are available with standard threads or with deflected locking threads. They can be applied after the mating parts have been painted or enameled.

NOVEMBER, 1952

VOLUME 126

No. 11

RAILWAY Mechanical and Electrical Engineer

Founded in 1832 as the American Rail Road Journal.

Editorial and Executive Offices: 30 Church street, New York 7, and 79 W. Monroe street, Chicago 3. Branch offices: Terminal Tower, Cleveland 13; 1081 National Press bldg., Washington 4, D.C.; Terminal Sales bldg., Portland 5, Ore.; 1127 Wilshire blvd., Los Angeles 17, Cal.; 244 California St., San Francisco, Cal.; 2909 Maple avenue, Dallas 4, Tex.

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Now- with HYATTS

Fewer Hot Box "set-outs" to delay freight movement

The elimination of hot boxes is a management problem—railroad officials and operating personnel all keep an eye on operating costs and they recognize that a great revenue eater is the expense resulting from hot boxes.

It is hard to pin down what the average hot box costs per "set-out;" but some say $100—others $150 and still others say $200.

If freight cars are equipped with Hyatt Roller Bearing Journal Boxes—a great step will have been taken to wipe out a segment of unnecessary operating expense.

What are your needs? It is our suggestion that no railroad purchase of new freight cars be made until the outstanding advantages of Hyatt Roller Bearing Journal Boxes are fully explored. We will gladly serve you. Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.

HYATT OFFERS EXTRA ADVANTAGES

FREE LATERAL, a unique Hyatt design advantage, allows freedom of axle movement through the bearing, thus cushioning shocks, minimizing wear on wheels and truck parts, and insuring against damage to lading.

NO PRESS FITS TO BREAK when removing boxes for inspection.

REDUCED INVENTORY is possible because spare axles and wheels need to be fitted with only inner races and spacer sleeves.

STRAIGHT RADIAL ROLLERS of generous size provide for maximum load-carrying capacity and longer usable life.

SIMPLICITY OF DESIGN permits examination of all box and bearing parts with utmost freedom.

HYATT ROLLER BEARING JOURNAL BOXES *for freight cars*

Mechanical and Electrical Meetings Draw Almost 3,800 Attendance

CHICAGO, once again was host to the 2,624 railroad men and guests and 1,163 supply men that attended the meetings and exhibit in connection with the coordinated mechanical and electrical meetings of the Air Brake, Car Department Officers', Locomotive Maintenance Officers', Master Boiler Makers' and Railway Fuel and Traveling Engineers' Associations as well as the Electrical Sections of the Association of American Railroads. These annual meetings were held September 15 to 17 inclusive, and all of the sessions were held at the Hotel Sherman except those of the Air Brake Association which this year met at the Hotel Morrison. This year's exhibit of electrical equipment was held at the Hotel Sherman under the auspices of the Railway Electric Supply Manufacturers' Association.

On the second day of the meeting John P. Kiley, president of the Milwaukee, was the principal speaker at the Presidents' Luncheon at the Hotel Sherman. Mr. Kiley, with an audience entirely of mechanical men, dealt specifically with their problems. He voiced some concern about the training of diesel operating and maintenance forces for the future. With our technological improvement, he said, more highly trained men are needed in all departments, and such men are hard to find. Mr. Kiley then mentioned many instances, such as steam hose, couplers, window glass for locomotives, pipe fittings, battery boxes and filters where the progress of standardization has not gone far enough to avert expensive delays because parts do not fit.

Hot boxes, said Mr. Kiley, continue a most pressing problem and it is important to find the cause. On one road at least, the higher speeds incident to diesel operation were suggested as the cause of a lot of hot boxes, but another road reported, "We don't operate a single diesel locomotive but we've got more hot boxes today than we've had in years."

Mr. Patterson's Remarks

The first morning's session of the Locomotive Maintenance Officers' Association was addressed by W. J. Patterson, member of the Interstate Commerce Commission. He reviewed the progress made over 35 years in the enforcement of regulations intended to improve the safety of railroad operation. In 1907, 4,534 railway employees lost their lives, according to Mr. Patterson, whereas in 1950 the fatalities were only 390, an all time low. Injuries to employees likewise have been materially reduced. Mr. Patterson attributed a large part of the improvement in conditions with respect to accidents to cooperation between railroad management and their employees in the observance of Federal requirements for equipment on locomotives and cars which has been demonstrated by the statistics of so called "train service accidents." One of the specific matters of cooperation which Mr. Patterson referred to was the fact 35 years ago there were many types and kinds of couplers that would couple automatically and could be uncoupled without the necessity of men going between cars but they were of different designs making their operation and maintenance difficult, if not impossible. At present there is only one standard freight car coupler known as the Type E and a defective or inoperative one is a curiosity, said Mr. Patterson. Mr. Patterson, in speaking on matters relating to safety pointed out that questions are frequently asked as to the improvement in the efficiency of railroad operations. "At the Commission," he said, "we have available from month to month a series of important indicators of operating efficiency. Gross ton-miles per train hour is frequently referred to as the best single overall measure of railway freight transportation efficiency since it combines the speed factor with the total weight of the train behind the locomotive and tender and reflects the average performance for each hour of train operation. In 1951 the gross ton miles per train hour were 89.2 per cent greater than in 1929. The advent of the diesel-electric locomotive particularly the increase in its use in freight service, in recent years has done much to improve operating efficiency as reflected by the increase in gross ton miles per train hour. In 1946 only 9.7 per cent of the freight gross ton-miles were handled by diesels as compared with 52.7 per cent in 1951. For the first five months of 1952 this percentage has risen to 62.7. In other words, almost two-thirds of the nation's railroad freight traffic is now handlel by diesel locomotives. The latest figures indicate that diesels handle about 70 per cent of the passenger train traffic, and 75 per cent of the yard switching service."

Speaking of air brakes, Mr. Patterson outlined the progressive advancement in the matter of power brakes and reviewed the fact that the Commission in 1922 entered upon an investigation to determine whether, and to what extent, power brakes and appliances for operating power brake systems then in general use were adequate and in accordance with the requirement of safety, what improved appliances or devices were available for use and what improvements in power brakes and appliances could or should be made to increase safety in train operation. He pointed out that "after comprehensive tests the Association of American Railroads adopted, effective September 1, 1933, revised specifications for freight-car power brakes making the AB type standard for new cars. Their interchange rules were also revised in November 1934, to require that all cars offered in interchange after January 1, 1945, be equipped with the improved brake. Failure of car owners to make adequate schedules for the conversion from the former brake equipment to the AB type on existing cars led to the issuance of an order by the Commission on September 21, 1945, requiring carriers to equip their cars used in freight service, except those equipped with passenger car brakes, with the improved power brake. The time limit within which this was to be done has been extended from time to time and now expires December 31, 1952. Consideration is now being given with respect to whether there should be a further extension of time within which to equip certain non-interchange cars."

Davidson Talks to Three Groups

Edward H. Davidson, director of the Bureau of Locomotive Inspection, Interstate Commerce Commission, spoke, on the second day of the meetings before the Boiler Makers' Association and, on the last day to the Locomotive Officers' and the Fuel and Traveling Engineers' groups.

To the Boiler Makers, Mr. Davidson made mention of the progress in the 41 years that is a matter of record, the reduction in boiler accidents being in the order of 856 boiler accidents to 35 boiler accidents and the reduction in fatalities from 91 to 2. Injuries dropped from 1,035 to 36 over the same period. "Because of technical developments," said Mr. Davidson, "we are witnessing what future generations may refer to as a revolution in motive power. This economic change may be compared to that which took place when development of the steam locomotive and rapid railway construction diverted transportation from water ways, canals and the Conestoga wagon train to the railroads. In the short space of 10 to 12 years we have witnessed the diesel locomotive become the favored type of railroad motive power until today all locomotives constructed for use on major American railways, with exception of a few steam locomotives for specialized services, are of the diesel type. At the present time approximately as many diesel locomotive units are in service on railroads under our

jurisdiction as there are the old faithful and reliable steam locomotives. This change in power type is bound to have extensive and far-reaching effects upon the various crafts. Because of the reduction in number of steam locomotives the amount of boiler work on the various railroads has decreased with consequent repercussions upon your craft. It may therefore be necessary for some of the younger members to adapt themselves to the changing conditions. Last year I mentioned that it is economically unsound not to utilize to the utmost the trained services of men experienced in your art and suggested that fuel and water tank work on diesels offered a field where the boiler maker would be particularly valuable. It would also be apparent that the boiler maker is, because of his layout training and experience in heavy plate work, particularly qualified to be affiliated with the welding field. His experience with metal forming and working together with knowledge of the behavior of metal under load would add perspective to his ability in welding activities. . . . "

In speaking before the Locomotive Maintenance Officers' Association Mr. Davidson emphasized the importance of teamwork in railroad operations.

"After a lifetime of work connected with locomotive operation and maintenance, the major part of which involved furtherance of locomotive safety," he said, "I have been impressed with the great number of instances where the victims of accidents were not primarily responsible for the basic cause of the accident. It is an ironic turn of fate that makes one man suffer because of the shortcomings or neglect of another. This is particularly true of railroading where one group maintains equipment that is operated by other members of the railroad team. . . ."

"I wish to call attention to some of the developing types of defects in diesel power which have been responsible for accidents and casualties and which should be carefully watched. The transition from steam to diesel power has been extremely rapid and the trend still continues. This change has developed many troublesome problems because of the closer tolerances found in diesel engines and the amount of electrical equipment involved.

"With exception of the oil-fired flash type heating boilers used on diesel units which have been responsible for relatively few accidents, there is not the danger of accident from large volumes of high-pressure steam encountered in steam locomotive practice. The majority of accidents in connection with diesel-electric units have, to the present, fallen into the categories of those caused by wheel failures, bearing failures, electrical equipment, falls, crankcase explosions and fires. . . .

"Based on the record of two serious derailments caused by broken wheels and failure of a considerable number of other wheels I would say that defective wheels constitute a source of major potential hazard in diesel operation. The failure in service of any one of these wheels can be the cause of a serious accident, so the gravity of the situation is apparent. I urge that all attention be given to inspection of diesel wheels by railroad mechanical forces. The problem of detection of defective conditions rests with the railroad mechanical forces if the situation is to be controlled."

In his remarks before the Railway Fuel and Traveling Engineers' Association Mr. Davidson spoke on the importance of the adequate preparation of inspection reports and of carrying through the corrective measures needed. If we are to know what we are doing in matters affecting locomotive maintenance, performance and safety, Mr. Davidson said, we must have records whereby results can be analyzed and difficulties traced to their source. Records mean reports and to be of any value the reports must be accurately and conscientiously prepared by competent persons having requisite experience.

Upon passage of the Locomotive Boiler Inspection Act and subsequent amendments, the various inspection forms, based upon requirements of the approved rules, were developed and placed in use. The daily locomotive inspection report, Form No. 2, is a very important report from the standpoint of the enginemen. This report is the means whereby the engineman can inform the mechanical department of defective conditions that are in need of correction. "Brevity," he said, "may be the soul of wit but on a daily report enough information as to the source and nature of the difficulty experienced should be shown to indicate to the shop forces the kind of attention necessary to effect a proper and lasting repair.

"In the course of investigation by the Bureau of reportable accidents many instances have been found where the defect responsible for the accident had been reported a number of times prior to the accident. Such conditions indicate that repairs, if made, either were not properly made or the basic cause of the defect had not been determined. Attention could profitably be devoted to the manner in which defective conditions are shown on daily reports and to corrective procedure employed by maintenance forces to rectify the defective conditions.

"What has been said concerning reports for steam locomotives applies with greater emphasis to diesel-electric locomotive units. Because of much closer tolerances, electrical equipment, particularly units of control equipment, must be maintained to a standard approaching perfection. A slight decrease in condition may result in a locomotive failure or an accident with attendant casualties.

"A considerable number of accidents have occurred on this type of equipment which were caused by defective electrical contactors and in which injuries resulted from electrical flashovers or explosions. In this equipment failure frequently occurs suddenly without the warning that is often found in steam-locomotive practice. It is therefore essential that terminal inspections be thorough and comprehensive if road failures are to be avoided.

"Inspection reports are the sign posts which are the guides to proper maintenance and safe locomotives. They are not merely annoying paper work but are the index of locomotive safety and economical operation."

COORDINATED REGISTRATIONS—1950-1951-1952

Associations	1950 Railroad Men	1951 Railroad Men	1952 Railroad Men
Air brake	176	280	135
Master Boiler Makers'	216	215	127
Car Department Officers'	373	563	523
Locomotive Maintenance Officers'	746	1,017	840
Railway Fuel & Traveling Engineers'	475	268	433
Electrical Sections, A.A.R.	175	155	205
	2,161	2,498	2,263*
	Supply Men	Supply Men	Supply Men
Railway Electric Supply Manufacturers'	236	...	305
Allied Railway Supply	737	...	1,003
Allied Railway Supply, Mechanical	...	1,152	...
Allied Railway Supply, Electrical	...	168	...
	973	1,320	1,308
Total	3,134	3,818	3,571*

Note: The 1950 and 1952 exhibits were of electrical equipment and the 1951 exhibit was mechanical equipment. The supply companies' registration of representatives, therefore, is not directly comparable.

*These totals do not include 361 associate members and guests registered with the six associations, most of which, presumably are supply men also registered with the two supply associations and included in their totals. In addition 803 ladies were registered.

H. C. Haviland,
President
(Supervisor boilers, N.Y.C.)

Boiler Makers Celebrate 50 Years of Service

Expansion of association interest into new fields resulting in increase in membership

H. R. Barclay,
Vice-Pres.
(General boiler inspector, G. N.)

A. F. Stiglmeier
Sec.-Treas.
(General supervisor boilers and welding, N. Y. C. System)

Organized in 1902 the Master Boiler Makers' Association can look back on a half century of service to the railroads. At its 35th annual meeting it recognized the contributions made by the association to the development and maintenance of the steam locomotive boiler during this period. It also recognized the loss to its organization resulting from the current transition of motive power from steam to diesel-electric.

The highlight of its 50th anniversary celebration was an address by C. B. Peck, *Editor*, Railway Mechanical and Electrical Engineering, who reviewed both the history of the association and that of the steam locomotive boiler during the past 50 years.

Mr. Peck told the formation of the association in 1902 at St. Louis as the International Master Boiler Makers' Association and its later amalgamation in 1907 with the Master Steam Boiler Makers' Association. He reminded the meeting that three of the 66 charter members of the International Master Boiler Makers' Association are still living—J. A. Doarnberger, its second president, and retired master boiler maker of the Norfolk & Western; F. A. Batchman, retired boiler foreman of the New York Central, and John McDermott, retired from the Illinois Central. Mr. Peck paid tribute to its officers in the early years and especially to its secretaries, Harry D. Vought, who held the position from 1908 to 1929 and to his successor, Albert F. Stiglmeier, general supervisor of boilers and welding, New York Central System who done an outstanding job since that time. [Mr. Stiglmeier was re-elected secretary of the association for 1952-53—Editor.]

In speaking of the character of the association Mr. Peck said, "This body, from the beginning has been an organization of individuals, all of whom value their independence highly but who know how to work together effectively for the accomplishment of their purpose." "The committee reports," he said, "have offered each member valuable help in setting up yard sticks with which he can measure his own methods and see their strong points as well as their weaknesses. Such reports have served the real needs of the members so far as practice is concerned. The reports which have dealt with the science and engineering background of some phases of the master boiler makers' responsibilities have been broadening and have made the association a leader in its field."

President H. C. Haviland, supervisor of boilers, New York Central System—East, in his opening address acknowledged the adverse situation confronting the association and its members. Evidence of what the association is doing about the situation was presented by Mr. Haviland when he welcomed the new members, many of them welding and water service supervisors (127 new members joined the association during the past year). He also told the individual members, "There is little to be gained by bemoaning the fact (dieselization). We can spend our time more wisely by adjusting ourselves to the situation as rapidly as possible." How boiler supervisors can adjust themselves is covered specifically by the first of the association's reports presented in this issue.

The association had four guest speakers. In addition to the historical review presented by Mr. Peck the meeting was addressed by W. C. Wardwell, superintendent of equipment, Lines East, New York Central; E. H. Davidson, director of the I.C.C. Bureau of Locomotive Inspection, and C. T. DeWitt, superintendent of safety, Northern Pacific.

Mr. Wardwell spoke on the benefits to the railroads derived from association activities and on possible future work on the Master Boiler Makers' Association. Benefits he mentioned included: (1) The application of the ideas presented in the technical papers and discussions result in large money savings; (2) in preparing papers men become interested in means for improvements that would otherwise be uncovered; (3) the meetings present an opportunity for open discussions on all phases of maintenance; (4) supervisors by personal discussions with fellow members solve in a few minutes many problems that have bothered them for a long time; (5) a large geographical coverage of subjects is made possible by the continent-wide scope of the attendance; (6) attendence stimulates the thinking of supervisors and opens new avenues of thought; (7) the friendships made at meetings provide contrast for later correspondence on mutual problems, and (8) the printed proceeding make available valuable facts on new or better methods of handling maintenance work.

Mr. Wardwell emphasized the fact that new associations were not required to work out the many new maintenance problems presented by dieselization. In this connection he praised the M.B.M.A. for its interest in the welding of diesel parts, in steam generator maintenance and in diesel water supply. He also called particular attention to the many boiler supervisors that have "swung over" from boiler to mechanical and electrical maintenance—a good supervisor need not be confined to the special field in which he was trained.

Mr. Davidson's address before the association has been consolidated with addresses he made before two other associations and will be found elsewhere in this issue.

Mr. DeWitt said in speaking on safety "We learned long ago that the best engineering and the best mechanical safeguards are not in themselves enough to protect employees from accidents. With something that sometimes amounts to genius, men will get hurt on machines we thought were fool-proof." Education in safety, he said, is the principal answer—"We should think and talk safety continually to remind men of the impartant things they are constantly forgetting—they must be taught, told, retold, and sold on safety." Mr. DeWitt told the audience that "If we get discouraged because the 5 year old safety story needs constant repetition, let us remember that the twenty centuries of the Christian religion has not eliminated the need for the ringing of church bells to remind people of their spiritual obligation".

A special paper covering 50 years of water treatment progress prepared by Carl A. Harper, past president of the association, was resented to the meeting. The paper reviewed the improvements in boiler performance and the large savings made possible by water treatment since 1902 and pointed out that additional work needs to be done in this field to improve the efficiency of the remaining steam locomotives, the stationary boilers and, in many cases diesel-electric locomotives.

Two of the five technical reports presented at the meeting are omitted from this issue. One was a report on "Advantages and Disadvantages of Steam Generators for Stationary Steam Heat Plants." This report was presented by Chairman A. E. DeForest, assistant to superintendent equipment, New York Central System (Michigan Central District). The second was entitled "Study and Recommendations on Methods of Staying Side Sheets and Crown Sheets to Eliminate Threading of Holes," presented by Chairman F. R. Milligan, general boiler inspector. Canadian Pacific.

The report on steam generators covered both fire-tube and water-tube designs. The committee said that "the use of packaged steam generators to replace boilers of conventional design has been based upon the marked savings in labor costs and supervision made possible by automatic and semi-automatic operation." It was the committee's opinion that the packaged steam generator is satisfactory for small plants but it cautioned that feedwater treatment is essential to minimize maintenance costs.

How Boiler Supervisors Can Educate Themselves for Other Positions

(This subject is of primary interest to boiler supervisors and to many other mechanical supervisors who have to meet the situation caused by the rapid replacement of steam locomotives by diesel-electrics. The committee preparing this report was comprised of both railway officers and boiler supervisors—Editor)

The introduction of the diesel-electric locomotive as the principal motive power unit on our major railways, has created a situation whereby a more or less complete re-adjustment of the duties and assignments allotted to the various crafts in the railway repair shops must be effected.

Those formerly concerned with the running gear of the steam locomotive and tender will find their sphere of activity somewhat curtailed. Much of the old familiar detail, such as rod and motion work, is replaced by the lighter, differently arranged and functioning detail parts of the diesel engine. The numerous auxiliary devices or accessories of the steam locomotive are now replaced by an entirely different set of equipment, the construction and operation of which differs entirely from that formerly used.

It would thus appear that no shop craft involved, is entirely free from the necessity of changing their outlook, acquiring new knowledge and readjusting themselves to meet the changed conditions. In this respect all may be said to be starting more or less from scratch.

The solution to the boilermaker supervision problem should not be difficult if approached from the correct angle. First, it must be borne in mind that the railroad companies will not seek, by themselves, to teach boiler supervisors new trades. This is the sole responsibility of the supervisors themselves.

Secondly, the boiler supervisor desirous of preparing himself for the duties of a supervisor in another craft must clearly recognize that no average supervisor can train himself to be an expert supervisor in all crafts, nor should he attempt to do so. Further, it is not necessary, in order to supervise mechanics of a craft other than his own, that he qualify as an expert in *all* branches of any one craft. In nearly every craft the large majority of both craftsmen and supervisors specialize to some extent. In practice, for example, you seldom find a machinist gang foreman who is an expert in machine tool work, air brake work, tool making, locomotive valve setting, erecting work and the preparation for welding of various locomotive parts.

A good supervisor is generally a specialist in one of the several branches of his trade and in addition has a workable knowledge of the other branches. In our own craft, you will find those who specialize, for example, on layout work, on new boiler constructions, on shell courses and the design and application of patches, on firebox work or perhaps the so-called sheet iron gang. Others are expert on flues and specialize on flue shop design, operation and the handling of flues. There are also those who specialize on flanging and press work.

It would then appear that boilermaker supervisors who wish to continue on as supervisors in the railroad field after the abandonment of steam locomotive must either have the seniority and knowledge to retain those remaining boiler supervisory jobs on diesel locomotives, or else make a survey of the possible positions which may be made available to them as supervisors of other crafts and prepare themselves for them. In this connection, it is well to consider what other occupations are more nearly comparable or easily associated with the boilermakers craft. For example, welding is an old story to boilermakers and is usually performed to much more rigid specifications than for other crafts.

Looking over the new motive power it would appear that the boiler making craft can rightfully claim the following details as coming more within their field than that of related crafts: underframe, cab structure, pilots, cabinets, fan casings and ducts, fuel tanks, water tanks, air reservoirs and heating boilers, and terminal installations for servicing diesel locomotives including fuel tanks, water tanks, sand containers and water treating facilities.

The construction of the diesel locomotive and the conditions under which they operate indicate that a considerable reduction in the amount of work accruing to the boiler shop may be expected. The extent to which this expectation may be realized will depend on many factors encountered during day to day service and may well prove to be much smaller than has been so freely predicted. Supervision and handling of water treatment for engine cooling and train heating boiler requirements is a continuation of present boiler water treatment service and should remain under our jurisdiction.

Members of the craft, and supervisors in particular, should set about acquiring a general over-all knowledge of the construction and the functioning of the diesel-electric locomotive. Such knowledge need not be as complete and detailed as that of the specialist, but particular attention should be given to a thorough understanding of all cooling water circuits and devices and the train heating boiler construction and methods of operation and control. Those engaged in roundhouses or in supervision where contact is made with operating departments would do well to familiarize themselves with the duties and requirements of roundhouse terminal administration and the train running rules to better prepare themselves for future promotion.

What can a man do to better fit himself for advancement. There is no definite pattern for success. There are, however, certain qualities that stand out in men that have achieved success and in the absence of a definite plan it may be well to try and emulate these. These shape up very nearly and in the order as follows: Appearance, degree of knowledge held in the field in which he serves and the ability to speak and impart his knowledge to others.

A man's appearance accounts for much. Whether he be clothed in an expensive business suit, a suit of homespun or overalls matters little; how he wears them matters much. His carriage and neatness of attire represent his full face value which frequently to the stranger is his first and quite often last impression and may result in the acceptance or rejection of the individual.

It would appear that those selected have had in addition to appearance and skill, the ability to sell themselves. This too is a necessary and valuable qualification. Men that attain the position of supervisors or leaders discontinue doing any of the actual work

themselves. They assume positions where they must be able to impart these ideas successfully to other men so they will realize the logic in them. To impart one's knowledge to another requires the ability to speak or talk depending on whom is to be convinced. If it be the official staff above the supervisor, it will stand him in good stead if he is able to speak presenting the facts and important matters in such a manner that those who are not fully conversant with the problem will fully understand. If it be the workman in the shop, then in good old fashioned shop talk that they will readily absorb. One way or the other a man must have the ability to speak or talk before a group or an individual.

With the difficulty now experienced in obtaining dependable supervision, men who are resourceful and who are willing to assume responsibility, it should be no problem for a former boilermaker supervisor who has properly prepared himself as above to convince management of his ability to assume a position of supervisor in a craft or crafts other than his own. Relief positions, brought about by the five-day week have provided excellent opportunities for training as they often cover supervision over mechanics of several crafts and varied responsibility as regard the operation of a terminal. These positions, due to odd hours, Sunday, and holiday work and changing tricks, are often more easily available than straight craft supervisory assignments. They should be eagerly seized upon by boiler supervisors seeking advancement.

In speaking before the Master Boiler Makers' Association in 1951, Mr. D. V. Gonder, Assistant Vice-President of the Canadian National Railways, paid high tribute to the boiler makers, and gave some advice that can well be repeated here: "You must be bold enough to face the future with courage and confidence. You have good reason for an abundance of both attributes. None of the mechanical trades demand more courage than boiler making. None has a better record of the type of conscientious, painstaking, successful workmanship that breeds justified self-confidence."

While many railroads have spent much money and time over the years to train and develop supervisors, this by itself is not sufficient. The appeal for supervisors with high qualifications must be genuine, in earnest, and have a more permanent reward, otherwise the incentive for men to train themselves for leadership in the railroad field will be lost. With the acquisition of diesel power certain crafts have borne an undue burden in the reduction of mechanical and supervisory forces. In a large measure on certain railroads this has been due to the influence and power exerted by larger and stronger crafts on management. Also on many railroads where the top level personnel have all come from one craft they have been prone to recruit additional and replacement personnel from the same group. This policy does not appear to be fair to all the crafts that converge to make a successful railroad nor does it appear to offer to the railroad the best plan for efficient leaders in its official staff. Knowledge is not the birthright of any one individual, any one class or any one group. It is the common heritage of all. Many men responsible for the high development of the railroads were never engaged primarily in the railroad field. Through the years many men from the ranks of boiler supervisors have served in high official capacity on several railroads and distinguished themselves in a very creditable manner. Many men from the boiler crafts have entered the railway supply and other railway service fields, attaining positions of prominence and technical skill. That more men from the ranks of boiler supervisors have not assumed positions of high capacity on all railroads is due to the policy of the railroad in drawing its supervisors from one or two crafts and not due to a lack of ability in the boiler supervisors' makeup.

The boilermaking craft in general, like the members of all other crafts and allied workers in the railway mechanical field, from top to bottom, are greatly concerned by the passing of that faithful old machine we all knew and loved so much, and the necessity of taking drastic re-adjustment in ways of thinking and working. Nevertheless the challenge is there and the fortitude to meet it lies in the hands of the individual to a great extent.

Instruction books, issued by the locomotive builders, articles in technical magazines and instruction courses conducted by the railways, as well as numerous books by various authors covering the subject are available, but the net results rest with the individual and his determination to prepare himself to fit into the new scheme of things.

There are those who take a gloomy view of the boiler craft's future, but turning for a moment outside the railway field, such people would do well to take note of the tremendous increase in the number and colossal size of the stationary steam generating units built and being built throughout this continent for public utilities and to meet the needs of the rapidly expanding chemical and pulp and paper industries. On the railways as well many old and new power plants are being modernized, and it would appear that steam is still and will continue to be in demand for many varied purposes and boiler construction and supervision will be with us for some time to come.

We fully realize that the supervisors have a challenge to meet during the transition period and are sure that it will be overcome if the railroad executive will only extend to the boiler supervisor confidence when promotion arises that he will be accepted on equal terms with the personnel of other crafts. Through the medium of this paper we hope to extend wise counsel so that the railways as well as the supervisor will benefit to the fullest by our efforts.

The boiler ranks have many leaders and men with outstanding ability for sale. It is recommended that the Master Boiler Makers' Association through the medium of its office by personal contact or transcript, place before the proper authorities of the American Association of Railroads a proposal that the A. A. R. in turn ask that top level management give more consideration in the selection of its supervisory forces to those leaders that come from the ranks of boiler supervisors that have and will continue to prove themselves able.

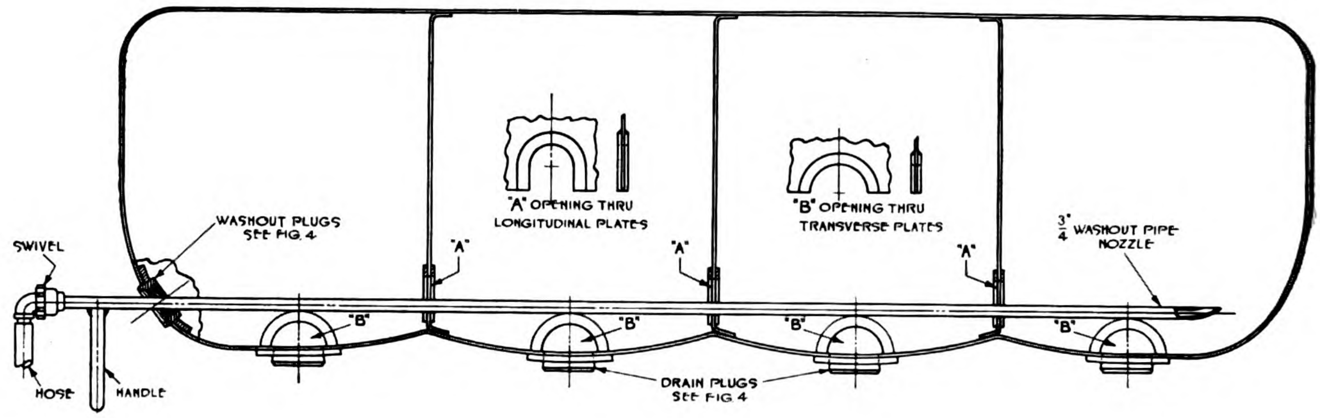
Diesel Water Tanks

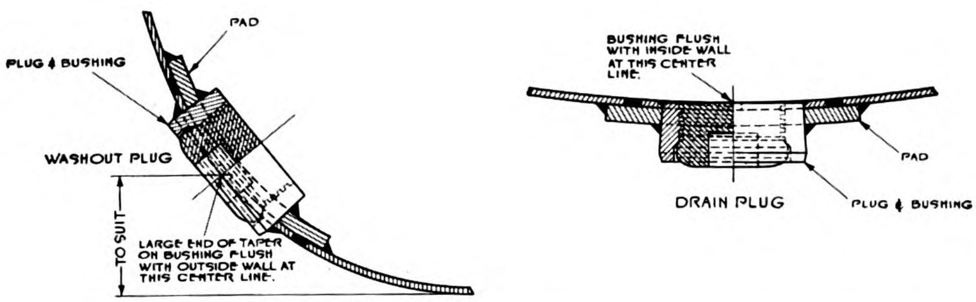
The committee reviewed the many difficulties with steam generators resulting from dirty water tank conditions, particularly on the earlier diesel locomotives, and then made the following comments and recommendations.

Since the beginning of passenger dieselization and steam generators, the water supply tank has been a great source of trouble. Difficulties as noted in previous paragraph is that baffle plates arrangement is such that it is impossible to properly clean each section. In most water we have corrosive substance, causing scale, and deterioration of metals. An Eastern railroad says, "We realize that this difficulty can practically be eliminated by properly treating the water before it enters the supply tanks." But this is not always as easily accomplished as it is to talk about it. There are the original costs for installing wayside treating plants at various points which may prove too costly, or for some other reason cannot be made, in which case water must be treated by some other method. It is when we are treating water by these other methods, and we believe most railroads do, that the best possible care must be given to the water supply tanks. If the interior of the tank is not thoroughly cleaned every month, these impurities are carried along with the water into the component parts of the generator and separator which frequently cause failures. Failures may be due to several component parts such as strainers, valves, piping, and generator coils. If scale formation is great enough, generator coils will blister, burn, or crack.

The committee believes that these water storage tanks are constructed in such a way, when received from the locomotive builders, that proper cleaning is impossible. We also believe that the manufacturer should be made to correct the condition and adopt a standard tank or tanks of suitable design and placed on the locomotive so that it would be possible to clean aand inspect these tanks. It should have sufficient openings in splash plates, so arranged they would be in parallel with the wash out plug openings, as shown on accompanying illustrations, and standard washout plugs. We also recommend to the manufacturer that before these tanks are assembled, the interior of all tank plates be given at least two coats of Apexior No. 3 or its equivalent.

If these recommended modifications are made by the builders, we believe the difficulty experienced with tank deterioration, clogged strainers and pipe connections, renewal of coils, etc., can be eliminated on steam generators, thereby saving the railroads costly expenditure in loss of steam generators. We know these difficulties can be overcome if we all agree that some changes must be made either by the railroads themselves on locomotives already in service, and by the builders on new locomotives.

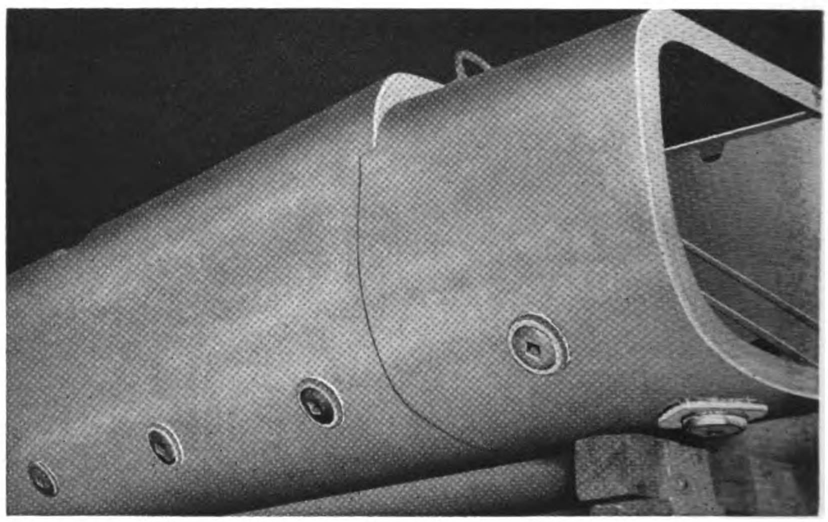


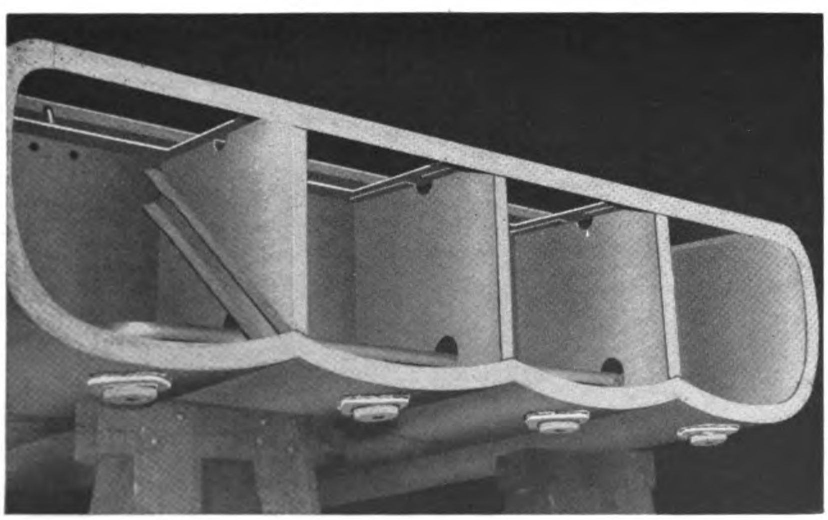


▲ Water-tank section showing openings in baffle plates and washout-pipe nozzle. Details of washout plug are shown in accompanying drawing.

▲ Application of bushing and plugs.

Application of washout plugs to ➤ diesel water tank. Plugs can be applied to one side or staggered.





◄ Application of washout plugs to bottom of diesel water tank to provide proper drainage of sediment and other foreign matter.

The water storage tank recommended by this committee as the most desirable for us to maintain is the one shown in the accompanying illustrations. Located under the frame of the locomotive, it can be handled with more economy, because of easy access to washout plugs and because it can be easily inspected and washed thoroughly without harming the electrical equipment.

Again we take this opportunity to say to the builder, why make the last place available on a diesel locomotive the place for water tanks and generators. Without a steam generator which will function properly in the winter-time, the diesel engine is of very small value to the revenue passenger who may get to his destination but will curse the railroad for its cold and uncomfortable cars. In this day and age, and with competition so keen, the passengers must be made to feel at home and be comfortable. Otherwise, they are going to seek other transportation means.

Welding Diesel Locomotive Parts

The basic construction of the diesel locomotive is somewhat different from that of the steam locomotive but the problems of maintenance are very similar in that both are composed of many parts subject to wear and occasional breakage. It would not be practicable to replace all worn or broken parts with new parts. The railroads are indeed fortunate to have available to them a number of processes whereby many worn or otherwise defective diesel locomotive parts may be satisfactorily reclaimed at considerable savings. The electric arc and the oxy-acetylene flame are two of the older and more familiar processes which are indispensable for maintaining both steam and diesel locomotives. The inert-gas shielded-arc process is also finding its place in the reclamation and repair of diesel locomotive parts.

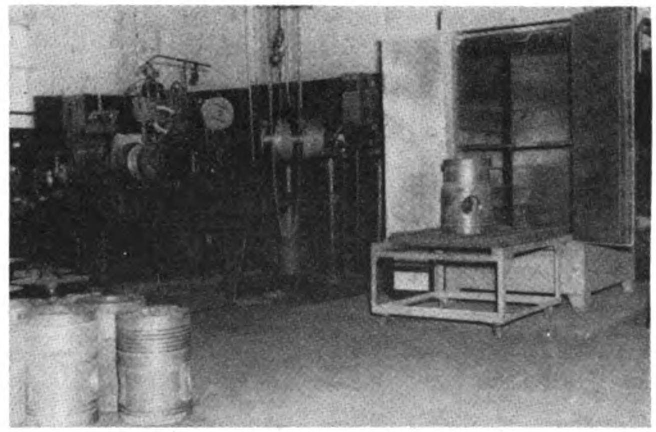
A notable achievement of the inert-gas shielded-arc process is the automatic welding of aluminum pistons in which the filler metal is fed from two coils, one wire carrying the current while the other furnishes additional metal to increase the rate of deposition. Cracked aluminum pistons are repaired by a manual adaptation of this process. The filler metal, which also carries the current, is fed from a reel through a portable hand gun and is consumed in the arc to form the welding puddle. Some railroad shops are using the inert-gas shielded-arc process with a nonconsumable tungsten electrode for welding cast iron cylinder heads. This process, using both tungsten and consumable electrodes, is also being used for welding aluminum and stainless steel parts and for bronze overlaying.

In some cases, where applicable, and where the required buildup is small, metal spraying has proved to be very economical. Present indications are that the use of the metal spraying process, using molybdenum wire, will be extended to include many more diesel locomotive parts.

The knowledge gained through many years of experience in welding on the steam locomotive is being used to good advantage on the diesels. However, a great deal of experimental work has been necessary to overcome some of the new problems which have developed as the diesel units began to accumulate mileage. Suppliers of welding equipment have assisted greatly in developing new equipment and methods. As a result of their research, engine valves and aluminum pistons may be built up automatically much more economically than by the manual method. Furthermore, materials which are harder and tougher than the original material may be used for building up these and other parts, thus increasing the service life of the reclaimed part beyond that of a new one.

It is not the purpose of this report to describe in detail every welding operation which may be found on a diesel locomotive, but rather to call attention to the more important welding problems and to offer recommendations for performing the work efficiently and satisfactorily. Many of the welding operations do not require more than an average skill on the part of the operator. However, there are certain jobs which require careful study and planning in order to obtain the desired results.

Most of the critical welding on a diesel locomotive is found on the diesel engine. The early types of diesel engines had cast iron crankcases and cylinder blocks, a number of which are still in use on switching locomotives. The modern diesel locomotive engine consists of a crankcase and oil pan fabricated entirely by welding. The main parts, besides the crankcase and oil pan, are cylinder liner cylinder heads, cylinder head retainers and moving parts such as pistons, valves, connecting rods, crankshaft and camshaft and several bearings of various sizes. There are also several appurtenances attached to the engine which contributed to the proper functioning of the power plant.

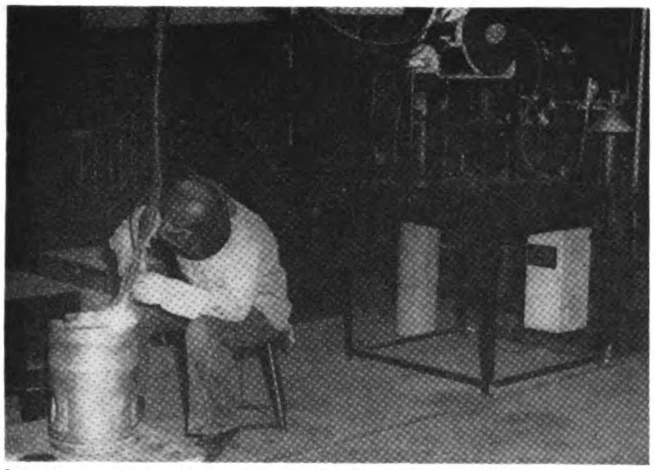


Automatic equipment for reclaiming piston ring grooves on aluminum diesel pistons. To the right of the lathe is the piston preheat furnace.

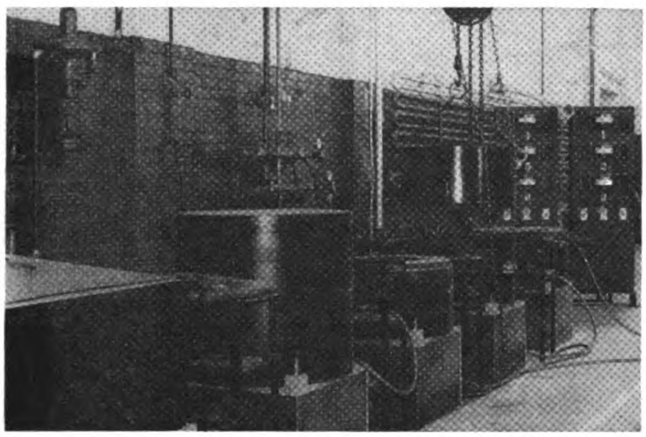
Automatic welding equipment mounted on lathe. Note aluminum piston prepared and mounted for reclamation.

When it is considered that there are many machined parts and working parts that must be held to very close tolerances, it may be readily seen how important it is to control expansion and contraction when it is necessary to make repairs to the crankcase or oil pan by welding. Welding indiscriminately on any section of these engines and failure to control the heat input while welding would most certainly disrupt these close tolerances and cause subsequent failure in some part of the engine. When items such as pistons, valves, cylinder heads and cylinder liners require welding, these parts may be prepared and welded under conditions which may be carefully controlled. As these parts are accurately machined after welding the small amount of distortion which is present may be disregarded, provided there is sufficient material to permit machining to the required dimensions.

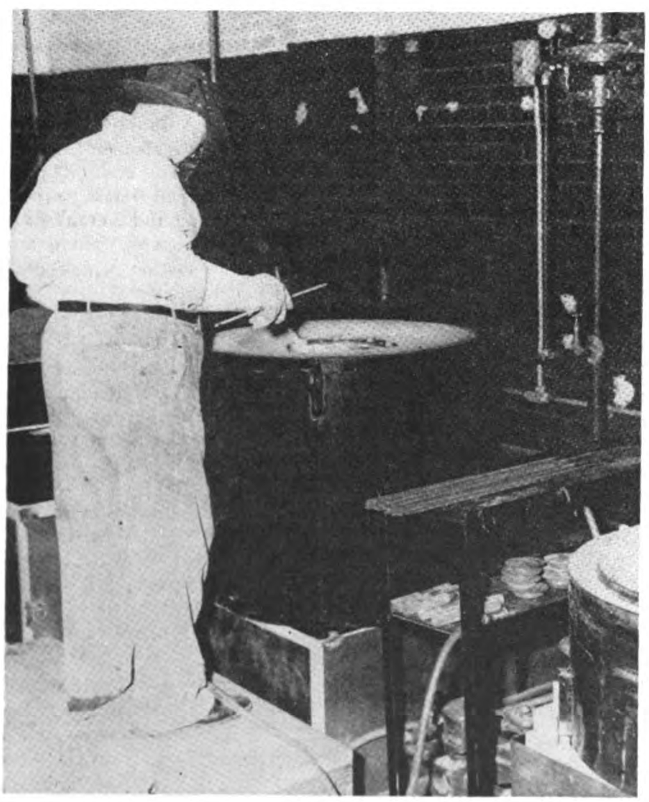
The cutting torch is being used quite extensively on the diesel locomotives. However, due to the necessity for avoiding harmful distortion, an acetylene cutting torch should never be used for removing any cracks or defects in the engine crankcase assembly except as a last resort. Chipping or grinding is preferred for this purpose.



Operator welding cracked piston heads with inert shielded arc gun using consumable aluminum electrode.



Cylinder head preheat furnaces with control panel in background. Furnace controls are equipped with visual and audio alarms to safeguard against overheating.



General Rules for Diesel Welding

There are several rules which apply generally to welding on all classes of diesel locomotives, regardless of make. The placing of the welding ground, for instance, might result in considerable damage if not properly located. The welding ground should be connected to the part on which welding is to be performed in such a manner as to prevent any possibility of the welding current passing through ball or roller bearings or any other vital parts where arcing could result in serious consequences. Also, every precaution must be taken to protect machined parts against arc burns and weld spatter by properly covering exposed surfaces. Arc burns may be caused unintentionally by loose ground or by accidental contact of electrode or holder. Several failures on steam locomotives have been traced to this cause.

Extreme care must be execised when welding exhaust stack assemblies of diesel engines so that weld spatter and welding slag are not permitted to drop inside of stack where they can gravitate onto valve seats or piston assemblies.

The prevention of fires is of the utmost importance. Oil, which is essential to the operation of a diesel engine, presents an ever-potential fire hazard which is difficult to control. Any location where there is an accumulation of oil must be carefully protected against sparks. Every precaution must be taken to put out instantly any fire which may be started. Even small fires have been known to cause considerable damage to electrical equipment. Sometimes inflammable solvents are used for cleaning. Before doing any burning or welding, it must be definitely determined that there is no danger of fire from this source.

On locomotive nose repair, torch work must be avoided around the windshield and headlight contours as these contours are generally blended out with body solder which melts at a relatively low temperature.

Fuel tanks, which are fabricated entirely by welding, require that certain precautions must be taken when it is necessary to make repairs. Before any cutting or welding is to be done on fuel tanks, they must be thoroughly cleaned of all materials which are liable to cause fires or explosions. As a general rule, thorough steaming of the interior of fuel tank for a period of 12 to 18 hours, after it has been completely drained, followed by flushing with warm water, will remove the danger of fire or explosion. All vents must be kept open during cutting or welding. Recommended procedures for preparing fuel tanks for welding may be obtained from the American Welding Society, the American Petroleum Institute or the National Board of Fire Underwriters. In some cases, small leaks may be welded without draining the fuel, but before it is safe to do so, the tank must be completely filled with fuel oil. If possible, the leak should be caulked prior to welding.

Water tanks, which are also fabricated by welding, may be repaired without any difficulty provided they are clean and free from foreign matter. Until fairly recently, the majority of water tanks for diesel locomotives were manufactured with no provisions having been made for adequate cleaning. The importance of regular cleaning of these tanks has been recognized and the subject has been covered very well by a report presented at this meeting. There are a great number of water tanks in service on which it will be necessary to provide a means of cleaning. Welding is playing a very important part in this program.

Parts which are to be welded while in place on the locomotive should be made accessible as possible. To enable the welding operator to produce a welded joint of the highest quality, parts which interfere should be removed wherever possible. This will also facilitate the preparation, cleaning of slag and final finishing of the weld.

The size of the welding groove should be kept to a minimum consistent with good welding practice. Complete penetration of the joint with a minimum amount of filler metal is essential to prevention of excessive distortion. Short welds and frequent peening help to control stresses which, if allowed to build up, could result in serious damage. If at all possible, the back of the weld or plate should be "bucked up" while the weld metal is being peened. Where backing plates are not used, the root side of the weld should be cleaned and welded also, if it is possible to do so.

◀ Welder converting E.M.D. No. 1 type cylinder liners to No. 3 type by oxyacetylene welding.

Electrodes for Diesel Parts

The selection of the proper welding electrode or rod to be used on the various parts of the diesel locomotive is a problem which should be carefully considered. The extensive use of alloys in diesel locomotive construction has necessitated the use of several types of electrodes and rods which were not required for welding on steam locomotives. However, all of the alloys being used are readily weldable, and the only requirement is that the electrodes be of a tensile strength comparable to that of the alloy to be welded. Alloy metals are used for stress plates in diesel engines and also in certain cast-steel truck frames. Some manufacturers use alloy steel for fabricating the complete crankcase assembly. In order to preclude the possibility of using the wrong electrode for a certain job, it is suggested that electrodes of the higher tensile strength be used for all welding on engine crankcases, truck frames and parts which are subject to high service stresses. A.W.S. types E-7010 and E-7016 welding electrodes are recommended for this purpose. However, when it is necessary to build up surfaces which are to be machined, A.W.S. type E-6012 welding electrodes are recommended because of their better machining qualities.

Water tanks, fuel tanks, battery boxes, pilots, cabs, underframes, superstructure and other mild steel parts may be welded with A.W.S. types E-6010 and E-6012 electrodes.

Originally, type 310 lime-coated stainless steel electrodes were used for attaching hardened wear plates to truck pedestals and roller bearing housings. However, due to the difficulty which was experienced in removing the stainless steel deposits, A.W.S. type E-6016 electrodes have been substituted with satisfactory results.

Stainless steel and aluminum parts must, of course, be welded with welding electrodes or rods of the proper composition. Nickel base electrodes are used for arc welding of cast iron crankcases, cylinder liners and a few other cast iron parts. In some cases, a phosphor bronze electrode may be used for this purpose. Cast iron cylinder heads, however, are welded with the oxy-acetylene flame or inert gas shielded arc process, using a rod of regular cast iron composition or an alloy of nickel-moly cast iron.

Bronze welding is used for repairing and building up certain castings and for building up worn parts of electrical equipment. This process is not used as extensively on the diesel locomotive as it was on steam. However, there are a sufficient number of parts on a diesel locomotive—which would be difficult to repair by any other method now known—to warrant bronze welding.

Copper piping is used quite extensively on diesel locomotives. Due to vibration stresses, the joints are brazed together with a silver brazing alloy which is preferable to solder.

Certain parts of steam generators are made of high heat-resistant materials. One of these materials is inconel the welding of which requires an electrode high in nickel and chromium. Electrodes containing 80 per cent nickel and 20 per cent chromium are recommended for this purpose. On parts subject to severe abrasion, such as truck equalizers and buffer castings, wearing surfaces may be hard surfaced with abrasion resistant electrodes. Worn diesel engine valves may be built up with a non-ferrous alloy of tungsten, chromium and cobalt applied with an oxy-acetylene torch flame, either manually or automatically.

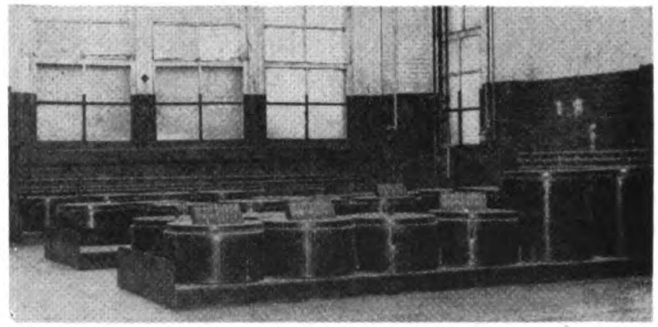
Centralized Operations Best

In order to take full advantage of the benefits of a diesel parts reclamation program, it is necessary to centralize operations at one point on the railroad where welding operators and supervisors may be properly trained. Much of this work requires a highly specialized skill which can be acquired only through hours of practice and experience. Frequent changing of operators must be avoided if it is expected to keep production and quality at a high level. Another advantage of centralized operation is that in case of failures due to faulty workmanship, responsibility may be quickly placed and corrective measures taken.

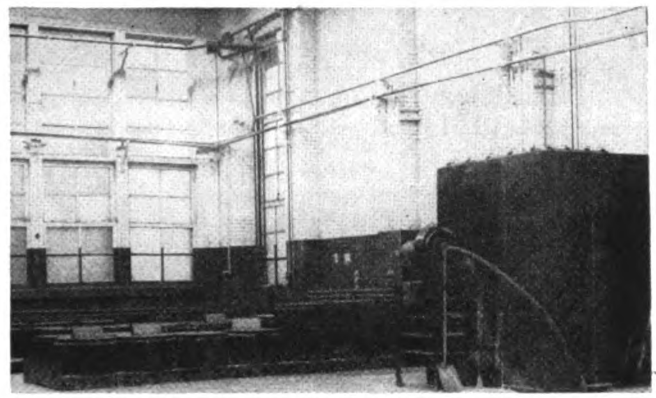
As previously mentioned, recommended procedures for welding several parts of the diesel engine as well as a few other parts of the diesel locomotive, and which it is felt will be of interest to Association members, are described below.

Crank Case Lower Deck Repair (Electro-Motive 567 series engine)

This procedure covers repairs by welding to cylinder liner seats in lower deck when damage occurs through failure of piston or related parts. The connecting rod usually damages the two sides of the bore. Frequently, the liner support plate material in this area is badly battered and must be built up, as well as the liner seats.



Controlled cooling rack for cylinder heads. Note blackboards on each cover, indicating welding date, welder's number and removal date.



Suction pump and storage cabinet for removing flake asbestos from cylinder-head cooling compartment. A door is provided in the cabinet to remove asbestos for application to welded heads to retard cooling rate.

The first step is to drain the crankcase and remove the complete cylinder assembly from damaged cylinder bore, and also the opposite cylinder assembly. Then remove all broken pieces of cylinder liner and other foreign material and clean both crankcase and oil pan well. Close all openings through which welding spatter and slag may enter the crankcase or oil pan. Cover exposed crankshaft journals to prevent weld spatter and chip damage. Insert metal chute under opening in lower deck where welding and boring will be done.

After the crankcase and oil pan have been thoroughly cleaned and all openings have been completely closed, the next step is to prepare the damaged area for welding. This is done by chipping off burrs and grinding the damaged surfaces smooth.

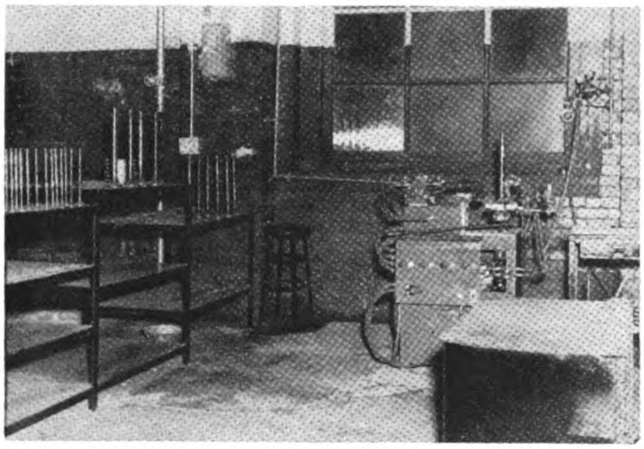
A.W.S. type E-6012 electrode is recommended for build-up welding because of its slagging and rapid build-up characteristics and also for its good machining quality. Maximum diameter of electrode recommended is 5/32 in. The weld metal should be applied in short beads, using a back-step sequence completely around seat. Peening each bead with a pneumatic tool will help to remove slag and reduce stress. In back-step welding, it is important that points where starts and stops are made are properly overlapped to avoid porosity and slag inclusions. In this type of build-up, it is essential that the weld metal be entirely free from defects. It is important, therefore, that all slag be completely removed before successive layers are applied.

To avoid excessive welding and to facilitate machining after welding, the minimum amount of weld metal to be applied should be checked with a suitable gauge having a movable indicator. The build-up should be sufficient to allow approximately 1/8 in. for machining.

Cast Iron Cylinder Heads

Cracked and worn cylinder heads may be reclaimed by welding with either of two processes, oxyacetylene or inert gas shielded

Removing flake asbestos from welded cylinder head and cooling box with vacuum hose.



Automatic oxyacetylene hard-facing machine for reclaiming diesel-engine valves. Note valve mounted in machine for hard-facing and finished valves on rack back of the machine.

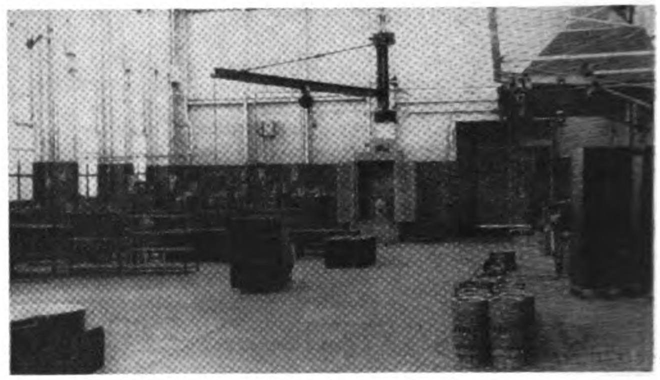
arc, using a cast iron welding rod. The rod may be regular cast iron or an alloy of nickel moly cast iron.

The cylinder heads are dismantled, cleaned and inspected for cracks and checked for wear. For inert gas shielded arc welding, the cracks must be grooved out, whereas for oxy-acetylene welding the cracks may be melted down with the torch flame and welded while the head is in the furnace. With either process the heads are first preheated slowly in a specially built furnace to a temperature of 1400-1500 deg. F.

When inert gas shielded arc welding is used, the preheated head is removed from the furnace and placed in an insulated box having a cover with small openings through which the welding may be performed, and welded before the preheat temperature drops appreciably. The reason for removing the head from the pre-heating furnace is that in inert gas shielded arc welding, the flame must be protected from drafts which tend to break the protective envelope of inert gas surrounding the puddle. The hot gases, issuing from the pre-heat furnace while it is in operation, are of sufficient velocity to interfere with the proper operation of the gas shielded arc method. To prevent hard spots in the weld, extreme care must be exercised when using the inert gas shielded arc process, so that the tungsten electrode is not permitted to touch the molten puddle.

When oxy-acetylene welding is used, the heads are preheated and welded in the specially built furnace where preheat and post heat temperatures may be accurately controlled.

After welding with either process, it is recommended that the heads be post heated at 1400 deg. F. for one hour and then placed in insulated containers, covered with an insulating material and allowed to cool slowly for two or three days.



General view of (a) automatic aluminum welding machine for reclaiming pistons; (b) automatic hard-facing machine for reclaiming engine valves; (c) cylinder-head welding, preheat furnaces and heat-control section of diesel reclamation shop.

Traction Motors

The traction motors are mounted in the truck and each motor drives a pair of wheels on the locomotive through spur gears. The alternating forces of propulsion and braking cause the various parts to eventually wear beyond acceptable limits. Parts which are subject to wear and which may be restored by welding are spline fits, frame bore, axle bore, bearing housings, gear case arms and motor support bearings. With the exception of the motor support bearings which are bronze, the worn surfaces of the traction motor may be built up with A.W.S. type E-6012 welding electrodes; $\frac{1}{8}$ in. diameter electrodes are recommended in order to keep heat down to a minimum. To avoid local heat concentration, weld passes should be staggered throughout the area being built up. Each increment of weld should be peened with a blunt tool immediately after it is deposited to stress relieve the welded area. This will also serve to cool the part and clean the weld.

The motor support bearings wear down on the hub face and may be built up with bronze either by the oxy-acetylene, manual or inert arc process. To prevent the babbitt from melting out, the bearing is immersed in water up to a level to permit welding. Recently, tests have been conducted with inert gas shielded arc welding using a leaded bronze wire for building up the worn hub faces of these bearings. Results have been very promising.

Center Plate Assembly

The center plate assembly consists of a bolster made up of vertical and horizontal plates welded to the underframe of locomotive and to which is attached a circular center plate or casting. In some diesel locomotives, the center casting is an integral part of the locomotive underframe which is cast in one piece, being similar to the cast steel frame of a steam locomotive. However, the majority of diesel locomotive center plate and bolster assemblies are fabricated by welding, having either a fabricated or cast steel center plate welded on.

Failures have occurred in some parts of the center plate assemblies on all types of diesel locomotives except those having a one piece cast steel underframe. In some cases, it has been necessary to modify and strengthen the original design.

The welding of cracks in cast steel center plates while in place on the locomotive is not recommended. The cracked plates should be removed for welding and stress relieved before re-application. For removing welds, a cutting torch equipped with a gouging nozzle is recommended. After the center casting is removed, the weld metal remaining on the bolster should be chipped off and ground flush with plate. It is recommended that badly broken center castings or those containing serious casting defects be replaced with new ones.

A.W.S. types E-6016 and E-7016, $\frac{5}{32}$-in. welding electrodes are recommended for welding the bolster plates and also for welding the center plates to the bolster. The center plate or casting should be welded to the bolster, using a backstep sequence of welding. The weld beads should be applied in approximately 6-in. increments and peened thoroughly after each bead is deposited. The back-step sequence is continued until all welding is completed.

Road Supervisors Talk Power and Personnel Problems

Chicago program dealt with diesel operation, training of crews, human relations and safety

R. H. Francis
President
(General road foreman, equipment, St. L.-S F.)

The pitfalls which dog the footsteps of diesel locomotive crews and their supervisors during the days of their early training were the subjects of several reports presented at the fifty-third annual meeting of the Railway Fuel and Traveling Engineers' Association held at the Hotel Sherman, Chicago, September 15, 16 and 17. Other subjects considered were human relations, safety, prevention of rough handling, trends in water treatment under dieselization, fuel for both diesel and steam, and the electrical control systems of diesel locomotives. A joint meeting of the Air Brake Association and the Railway Fuel and Traveling Engineers' Association was held on the afternoon of the first day for the discussion of a report on passenger and freight train handling and dynamic braking. The completion of a program of 15 reports, papers and addresses during the other four sessions precluded discussions at these session.

In opening the meeting the president, R. H. Francis, general road foreman equipment, St. Louis-San Francisco, spoke of the progress that is being made in the field covered by the association and said that there is no better way to keep abreast of this progress than to attend the annual meetings of the association to listen to well-prepared papers on important subjects, and to exchange ideas through discussion. The purpose of the association has always been, he said, to improve the efficiency of its members in their contribution to the success of the railroads in providing efficient transportation for the country.

Speaking of association affairs, he said that its membership had increased over that of a few years ago, and that it is now in sound financial condition.

Summaries or abstracts of most of the addresses, reports and papers follow. An address by Edward H. Davidson, director, Bureau of Locomotive Inspection, Interstate Commerce Commission, on the importance of making informative work reports is reviewed on another page in this issue. In addition to the reports and papers which follow there were presented a report by T. V. Methe, road foreman of engines, New York Central, which deals with the methods of teaching enginemen and firemen the functions and operation of Vapor-Clarkson and Elesco steam generators, two papers illustrated by slides of wiring diagrams, one by R. L. Henderson, Transportation Division, General Electric Co., on the Alco-G.E. excitation system, and the other by A. A. Mikolaitis, training instructor, Electro-Motive Division, General Motors Corp., in which he traced separately the seven electrical circuits which constitute the electrical system of the E.M.D. Model F7 locomotive, and a paper by T. L. Henley, chief fuel supervisor, Missouri-Kansas-Texas, which defined the characteristics of diesel fuel oil that are met in fuel specifications and described how they are tested. This paper will be the subject of an article in a later issue.

W. H. Fortney
Vice-Pres.
(Chief road foreman engines, C. C. C. & St. L.)

E. L. Reeves
Vice-Pres.
(Trainmaster, B. & O. Chicago Terminal)

L. H. Peters
Sec.-Treas.

Public and Employee Relations

In his address on the subject of Public and Employee Relations, L. C. Porter, vice-president, Texas & Pacific, voiced the conviction that no railroad can enjoy a full measure of success in its operations, and particularly in its competition for business, without good public and employee relations. The responsibility for the program he said, is not alone that of the public relations officer, but the primary responsibility of the department heads and subordinate officers who employ men and women and direct their work. The employees who come in direct contact with the public "will not ordinarily be more interested in the maintenance of good public and employee relations than the officers who direct and supervise their work," he said. "Nor can junior officers be expected to be more alert and interested than the heads of departments, especially of the operating and mechanical departments in which a very large number of railroad people are employed. It is equally the job of every railroad officer to study ways and means to improve the service, to look behind complaints for causes and, where they exist, take immediate corrective steps."

Public relations means association or dealings with people, and there are two kinds, good and bad. "It is my view," he said, "that the principal way for the railroad to create good public relations is through the right kind of attitude on the part of the employees toward the public, plus good transportation service. The attitude and action of employees toward the public may be everything desired, but if the services of the railroad are not good in every way, then public opinion is going to be bad. By the same token, the services of the railroad may be excellent in every respect, but if the attitude and action of the employees toward the public are bad, then bad public relations are inevitable."

Mr. Porter recited the chain of contacts of a passenger with railroad and pullman employees from the ticket office to the end of the trip. If all the employees are courteous, friendly and helpful, the passenger has a kindly feeling toward the road; that is good public relations. But the discourtesy of a single employee in the chain of contacts will destroy the effect of the good conduct of all the others; this creates bad public relations.

"There are some other aspects which enter into the creation of good or bad public relations," he said, "Passengers want to travel in clean, well-kept equipment. It is important, therefore, that the toilets and washrooms in the coaches and Pullmans be kept clean. Unless they are, bad public relations are inevitable.

"Another important factor in the creation of good public relations is the matter of handling passenger trains. People instinctively resent rough handling. And especially is this true at night when passengers are asleep. If their rest is disturbed by rough handling, they are going to complain about it, and that is bad public relations."

Mr. Porter stressed the importance of all in positions of leadership demonstrating by their own practice that they believe in the importance of such personal characteristics as kindness, thoughtfulness and courtesy. "Our attitude and our actions toward the public and toward our fellow workers," he said, "actually are shaped by the little things we do from day to day as we go about our work. These little things in our lives become habits which, in turn, shape and mould our personalities and our characters. Thus, they are far more important than we realize because they are the things which make us good or poor leaders, which lift us up or hold us down, and which play such an important part in the shaping of good or bad public and employee relations."

Supervisor's Responsibility in Safety

R. P. Hamilton, superintendent safety, St. Louis-San Francisco, addressed the meeting on the subject of the supervisor's responsibility in promoting safety. He spoke in part as follows.

I don't know of any more effective way of selling safety to railroad employees than through their supervisors. Unless the supervisor is so permeated with safety ideas that he is enthused with that subject his employees will never catch the safety spirit.

Loyalty works from the top downward, never from the bottom upward. If a supervisor expects to get loyalty from his employees, he must first be loyal to them. So it is with safety. We, as supervisors, must display a genuine interest in safety so as to instill into our employees an abiding safety complex. We cannot become enthused about safety today and forget it tomorrow and expect to get the results that we should have. The supervisor must himself be a good example of how a man should perform his work safely. He must also be the type of man who is a good leader so that his employees will willingly and gladly follow his advice; most men actually work for the "boss" and not for the company.

What It Takes to Teach Safety

Here is a formula for the success of a supervisor in teaching safety to employees: (1) to study; (2) to live it; (3) to teach.

Before we can teach others, we must know how to teach. But studying after leaving school or college has become a lost art. Too few are preparing for the job ahead, so as to be ready for it when the opening occurs. Frequently, when promotions are made, men who were passed by wonder why they were not promoted. Preparation must come first.

The supervisor has a responsibility to study and prepare himself to be a good safety leader. He should read safety literature and study matters pertaining to his particular field. He should learn the best method of effective approach to employees to get their fullest cooperation and the best results from each. He is a salesman selling safety.

Emerson wrote, "What you are speaks so loudly I can't hear what you are saying." The most effective way to convince others that we are sincere is that we live what we preach. I once saw this happen in a large steel mill. A sign in the engine room read, "Positively No Smoking. Aanyone violating this rule will be discharged." One of the bosses entered the room smoking a cigar and the engineer in charge pointed to the sign and said, "There are a number of fire hazards in this room. I would appreciate your not smoking in here." The boss shouted: "Don't tell me what to do. I don't take orders here, I'm the one who gives them." I might add that when the "big boss" learned of the incident a change was made and the man who thought he was too big to obey the rules was no longer connected with the company.

You can't build loyalty on such a basis. Unless men see in their supervisors an inward loyalty to the management's regulations, they will soon regard most of them as an outward display and treat all rules and regulations accordingly.

More and more the supervisor's task is teaching. The day of driving men is past. Most men will respond to good leadership and to sound, clear-cut, well-meant advice. If the supervisor has studied to prepare himself for his task in safety matters and is himself a true convert to the cause the teaching becomes easy. The fact that he knows and lives safety gives him the necessary prestige with his men. Personal contact, especially if the workman is made to feel that the supervisor has a personal interest in him, will not fail to get results.

The Reward

What is the reward for the supervisor who measures up to his task as a safety specialist? In most other activities the results can be plainly seen. We cannot say definitely what a supervisor accomplishes because of his efforts in safety, but we know if he will earnestly prepare himself by studying safety and living it and doing his best to instruct his employees, he will have a satisfaction that few other phases of his work can offer.

Efficient Use of Locomotive Coal

In a paper on the availability and efficiency of the steam locomotive, C. R. Patterson, regional locomotive fuel supervisor, Canadian National, reviewed the parts played by the back shop and enginehouse, water treatment and improvements in the locomotive, particularly as to the front end and air distribution, in improving the efficiency and increasing the availability of the steam locomotive. He told of savings effected by the purchase of prepared coal. These included a reduction of about four per cent in the coal used, the elimination of steam failures and substantial savings in labor at the ash pit and in coaling-plant operation. He cited a reduction in the fines produced by crushing between the tender and the distributor plate from 25 per cent to 10 per cent by changing from the BK stoker to the HT stoker.

In speaking of the road foreman's responsibility for supervision of engine crews, he said that in the instances where these officers have been placed under the jurisdiction of the division superintendents rather than the superintendent of motive power, they are assigned to investigations which take their time away from their supervisory duties to the detriment of the service.

Prevention of Rough Handling

W. T. Rice, general superintendent, Richmond, Fredericksburg & Potomac, presented a paper on the prevention of loss and damage and personal injuries due to rough handling, of which the following is an abstract.

The subject of loss and damage has become of great importance as one of the controlling features in the cost of railroad operation. Vast sums of money are being paid yearly because of damaged freight, and dissatisfied shippers seek other methods of transportation for future shipments.

Personal injuries are being fought on all sides by railroad management because they not only result in personal suffering to the injured person and his family but frequently cause the loss of the services of a skilled employee who cannot be replaced in a short time.

The responsibilities of the men in the engine cab in our program to reduce damage both to property and individuals are many. Once a train starts moving from a terminal the movement is controlled by the engineman and many times, during the course of the train's travel from terminal to terminal, the efficiency of the man in the engineman's seat will determine whether or not his company will make a profit on that particular train.

In the first instance, a man to be promoted to an engineman must be thoroughly familiar with the physical characteristics of the portion of the railroad over which he will operate. This, coupled with a knowledge of the practical characteristics of slack action will enable him to control the throttle of his engine consistent with the grades and dips that will minimize the slack adjustment throughout the train.

The engineman must be thoroughly qualified on air brakes and realize the necessity of smooth stops that will not create a dangerous condition on any portion of the train. This is particularly true when handling passenger equipment. We must face the fact that certain passengers ride our trains with the full realization that any unusual handling will enable them to bring suit against the railroad claiming personal injury.

Much has been said concerning rough handling of freight equipment in yards and terminals. However, we must not lose sight of the fact that severe damage occurs to the freight we haul on the road. This damage is usually the test of the efficiency of the man who is handling the train.

The transition from steam to diesel was accompanied with an increase in train length and an entirely different type of operation in starting the train. Many of us recall the accompanying broken knuckles, pulled drawheads, and other failures that were a part of this transttion. These failures, however, became less as the men in the diesel became more familiar with the operation of the new power. The success of the diesel is largely due to the manner in which men in your position train operating crews.

An engineman is not only the lookout man for his own train, but can serve his company well by noting the irregularities or equipment failures all along the railroad. Such observation often reveals hot boxes, shifted ladings, fires, track and bridge irregularities and live stock on the track.

The full compliance with state, local and company instructions concerning crossings at grade or where operating through city streets can be of great assistance in preventing accidents. The keen observation of road crossings and approaching vehicles is extremely important as the first witness in any crossing accident is the engineman of the train, and usually his testimony is the controlling feature in placing the responsibility. The warning of track gangs by use of engine whistle when they are apparently slow clearing the track and report of such instances to the superintendent can prevent a horrible calamity.

The engineman also plays an all important part in loss and damage in yard switching. His action on signals given from the ground and the manner in which he controls his independent brake valve can frequently determine whether we will deliver a car on time to a satisfied customer or pay a claim to a disgruntled ex-customer.

In the final analysis, the instruction under which engineman works and the degree of efficiency is a direct result of the degree of efficiency of the road foreman or traveling engineman. I cannot impress upon you too strongly the necessity of continued instruction to your engineman along lines that will increase his interest in promoting the smooth, safe and efficient handling of all trains, both freight and passenger.

Education of Diesel Road Men

F. M. Roberts, road foreman of engines, St. Louis-Southwestern, in a paper on the education of road supervisors and engine crews, described the system followed on the road by which he is employed. This began with two weeks' instruction in the builder's school before diesel locomotives were delivered, followed by builder's instructor to accompany and instruct the road foreman after the locomotives went into service. The road foreman operated a locomotive until approved as an engineman by the instructor. He then instructed enginemen and received instructions concerning the fireman's duties. After full approval by the instructor, the road foreman also instructed the firemen. The builder's instructor continued to ride with the road foreman for some time, assisting him when trouble developed, but all instruction of the crews was done by the road foreman. Each road foreman must study the operating manual so that all road foremen give enginemen the same instructions. Enginemen must also read manual.

A new fireman is given 60 questions which he must answer within 60 days to remain in the service. After passing examinations on them he receives another set on which he is examined in a year. He is examined on a third set after two years' service. If he passes this examination he receives a final set of questions on which he is examined for promotion. Each road man is furnished an operating manual and a trouble-shooting pamphlet which he must carry while on duty. Firemen are required to make four or more and enginemen six or more trips over a division, accompanied by a road foreman or a qualified fireman or engineman, before being qualified to go out by himself. He has three copies of a letter on which are listed the subjects on which he must be informed before being qualified. Each road foreman signs for each item on which he has given instruction, and the last one to ride with him reviews the entire list. When he is qualified the engineman sends one copy of his letter to the superintendent of motive power, one to the engine dispatcher and keeps one.

During the first qualifying trip every effort is made to put the engineman at his ease. Instruction follows the order in which the crew is expected to proceed in checking all supplies and apparatus, including the position of all controls in the rear cab, and going on with starting and putting engines on the line, draining the air system, and checking the ground relay, over-speed trip, starting contactors, reset button on the governor, ammeters, control air pressure, auxiliary generator switch, and lube oil pressure on each unit and the P.C. switch on the operating unit. These items, failure to check which causes about 85 per cent of all delays, are printed on the cab door as a reminder.

Before the locomotive is moved the engineman, in his seat, is shown the operation of the throttle, reverse and transition levers, the brakes, sanders, etc. He is instructed in the procedure should

his foot come off the safety control pedal. Then the road foreman takes over the locomotive and handles it for the first half of the trip, demonstrating the various train-handling procedures. In controlling the speed of the train, the procedure to suit each track condition is demonstrated, including the use of the dynamic brake, the train brake and the independent brake.

After the engineman appears relaxed, usually about half way over the division, he takes over the operation of the locomotive, under the guidance of the road foreman. On subsequent trips, more thorough instruction is given, starting from the beginning and following through in a definite sequence, which is helpful in trouble shooting. The sequence is: (1) fuel pump must operate, (2) fuel oil must show in the sight glass, (3) engine must turn over, (4) engine must fire, (5) lube oil pressure must be normal, (6) engine must speed up, (7) locomotive must move, (8) each engine must carry its load, and (9) temperature must be normal. This combines operation with trouble shooting.

The single unit is the basis of instruction and it is broken down into systems, such as the fuel system, cooling system, etc. Then each system is broken down into parts and the road foreman explains what it is, where it is and what it does (the three W's). Safety precautions are emphasized.

In trouble shooting, the importance of not getting excited when something goes wrong is emphasized. Another point is to recall the last thing done before the trouble developed; the trouble will probably be associated with that. In locating trouble where an electrical circuit is involved it is better to trace the circuit back from the defective part than to start at the source of current and trace through to the defective part. Both men are shown how to make out work reports. Delays caused by diesel failures are reported to the master mechanic, the superintendent of diesel equipment, and the road foreman of engines. The case is described in a bulletin which states whether proper procedure was followed and, if not, states what should have been done. No names are mentioned in these bulletins.

The report opposes the creation of surprise defects and cautioned against impatience in dealing with the men while they are learning. For those who want to know still more about the locomotive the various circuits are traced in different colors on the wiring diagram. Every effort is made to answer the questions of the men fully. If the curiosity of the engineman who is interested in his job is not satisfied by the instruction which he receives he will tinker with the apparatus to get the answer. If it is true that "we are a product of our environment," then diesel enginemen will be only as good as they have been taught.

Water Treatment

The paper, by B. W. DeGeer, engineer water service and fuel facilities, Great Northern, briefly reviewed the three methods of water treatment developed for use in conditioning feed water for steam locomotives. These are external treatment, which requires high expenditure for tanks, pumps and chemicals; the Zeolite system, which also requires expensive plant and chemicals; the wayside or internal type, in which the chemicals are introduced into the wayside water tank or directly to the water column as water is being taken. He also explained the use of lignins and tannins which are used with the inorganic material to (1) prevent scale and corrosion in feed lines and heaters, (2) condition the sludge, or suspended solids, in boilers to prevent scale formation, (3) stop corrosion and pitting of boiler metal, and (4) assist in preventing embrittlement stacking of boiler sheets. The extensive use of organics has made the wayside method of treatment the most widely used.

The reduction of the number of steam locomotives in service has caused the abandonment of many external treating plants which have been replaced by wayside treatment. In a few cases all treating plants have been abandoned and a composite treatment in ball form, which is added to the tender, substituted. Unfortunately, however, there has been a general letdown in maintenance of injectors, boiler checks and heaters, in proper cooldown and thorough washing, and in boiler water testing and supervision of water treatment.

Diesel Cooling Water

Raw or improperly conditioned water in the diesel cooling system caused much trouble from scale, rust and sludge interfering with heat transfer and from corrosion of the various metals in the cooling system. There are as many as ten metals, besides carbon and synthetic rubber in contact with the water. Each pair of metals in contact is a potential source of galvanic corrosion. There are frequently other forms of metal attack such as crevice corrosion, cavitation and fatigue corrosion.

To overcome all the troubles mentioned, water-treatment chemicals must be low in price, stable readily soluble, and effective with all kinds of water against all types of corrosion and scale forming materials, All of the chemicals failed in one way or another except the chromate type now in general use.

Not only must the chromate content be up to specification, but the pH also must be maintained between 8.5 and 9.5. If water is absolutely pure it will be what we call neutral, neither acid or alkaline, and we say it has a pH of seven. If the pH is less than seven, we say the water is on the acid side and acids attack metals like iron and steel. Weak acids like vinegar or citric acid have a pH of about three. On the other side of the picture, if we add a little soda ash or caustic soda to water, the pH will rise above seven. The higher the pH is above seven, the more alkaline the water is. Chromate treated waters in the pH range between 8.5 and 9.5 provide maximum metal protection.

The pH of the water is stabilized and adjusted by the use of chemicals called buffers. If buffers are not used the pH may vary enough to cause trouble with aluminum, brass and solder if it gets too high and attack iron and steel if it gets too low.

Continuity of treatment is most essential and it is important that chromate concentrations be maintained at all times by additional treatment as necessary. Treatment is added frequently, often daily. This is necessary because of leaks at cylinder-head gaskets, liner seals, and loss of water and chemicals through tank overflow. The latter is frequently caused by condensation of steam piped to the radiator to prevent freezing on layovers, and from overfilling.

Every diesel terminal should have testing equipment and a routine check system installed. Treatment should be added immediately when tests indicate the need. It should be emphasized that the best treatment in the world is useless unless it is in the right place in the right amount, not part but all of the time.

At the meeting of the American Safety Congress last summer I had the pleasure of discussing chromate dermatitis, or skin trouble, with Dr. Louis P. Schwartz, the foremost dermatologist in the United States. Dr. Schwartz said that railroad employees handle many products far more dangerous than chromates such as lye, acids and cleaning compounds, as well as many detergent oils, etc. The only precaution he recommends is ordinary personal cleanliness. Wear gloves and other protective clothing when handling the dry product and launder as frequently as necessary.

Most workers are unaffected by chromates unless they are extremely careless in regard to personal hygiene. A few others are allergic to chromates and should be assigned to other work.

Diesel Steam Generators

Steam generators as used on Diesel locomotives are called upon to perform an almost impossible task. In a very limited space, they must produce up to 4500 lb. of steam per hour, with pressures up to 275 psi and once started, must operate automatically. Two types of steam generators are in general use, and unfortunately water conditioning dosages, blowdown schedules, etc. which give good results with one type may have to be modified somewhat to give best results in the other.

Both types of steam generators have been successfully operated with many different types of water conditioning. These include demineralized water with pH correction, lime-soda treated water with organics added, internal treatment with calcined potassium carbonate, internal treatment with alkaline carbonates, tannins and phosphate, Zeolite treated water with pH correction and tannin, etc. In general, heaver chemical dosages are used for the Vapor-Clarkson steam generators with total alkalinity running up to 50 per cent of the total dissolved solids, and blowdown is adjusted to control sludge rather than dissolved solids when internal treatment is used. Alkalinity between 25 per cent and 30 per cent of the total disolved solids is recommended for the Elesco units, and blowdown is adjusted to hold the dissolved solids sufficiently low to prevent carryover and to give satisfactory sludge condition in the generator.

Regardless of the type of water conditioning used, careful and

continuous supervision by qualified personnel is necessary if best results are to be obtained.

Smoke Abatement

In a report on smoke abatement in Washington, D. C., by a committee of which M. G. Stewart, road foreman of engines, Washington Terminal was the chairman, the procedures were described by which violations of the city smoke ordinance are investigated and measures developed to prevent their recurrence. The following table was presented showing the trend away from steam and toward the diesel in the Washington terminal.

LOCOMOTIVES IN AND OUT OF WASHINGTON, JULY 1936 AND JUNE 1952

	July 1936	July 1943	January 1952	June 1952
Steam in	2,592	3,431	704	506
Steam out	2,592	3,431	704	506
Diesel in	134	465	1,516	1,585
Diesel out	134	465	1,516	1,585
Motors in	1,062	2,032	1,640	1,502
Motors out	1,062	2,032	1,640	1,502
Yard:				
Diesel	....	4	25	25
Steam	21	31	3	3

Mr. Stewart referred to a portable air jet device which has proved effective in the enginehouse and dispatch yard for elimination of smoke when building fires in the locomotive. He also had blueprints of a smoke-washing device which greatly reduces smoke and fly ash while locomotives are being serviced on the fire track.

Safety Precautions on Diesel Locomotives

The report on safety precautions on diesel locomotives was prepared by a committee of which R. D. Nicholson, road foreman of engines, New York, New Haven & Hartford, was chairman. It listed the various safety devices on diesel locomotives for protection of the equipment and set forth a number of operating rules designed to prevent personal injuries. These specified dead circuits before checking electrical apparatus, stopping the locomotive before reversing, having power off the line before cutting-in or cutting-out traction motors, shutting down the power plant affected in case of grounds, short circuits or flashovers, shutting down an engine in event of unusual sounds or actions or if excessive vapor comes from the breather pipe, caution when wearing rubbers on metal engine-room floors, and caution against being thrown off balance when moving through the engine room while the locomotive is in motion.

Other precautions listed include keeping out of high-voltage cabinets and touching nothing in them unless the engine is stopped, and seeing that the particular low-voltage circuit is dead before removing a fuse for testing or renewal. Precautions against crank-case explosions are set forth in detail.

Operating instructions include keeping engine-room doors closed to avoid drawing dust into the engine room. Train brakes should be fully released before starting or the locomotive may drag the train and cause damage. Power should be applied carefully until all slack is taken up. Do not have control or fuel-pump switches on in both cabs at the same time when changing ends. Differences in auxiliary generator voltages on the two units may cause a heavy equalizing current through the fuel-pump or control wiring. The dynamic brake should be applied gradually and the locomotive brake should be kept off in case an automatic brake application is made while the dynamic brake is applied.

Do not block in contactors or relays in order to get power. Do not block open the engine fuel rack in case of a governor failure. If the throttle should be closed to "idle" the diesel engine will be unloaded with full fuel on and will run away.

Fires are usually of electrical origin. The first indication is the smell of burning insulation. Stop the train if the fire is found to be under the floor or in a traction motor. When taking charge of the locomotive make sure no rags or other materials are lying around, particularly in electrical cabinets. Watch for fuel-oil leakage. Here odor is an indication.

Among operating precautions which may be taken during preparatory time are care to see that all hose are coupled and cocks properly opened between the units after they have been separated for servicing or repair. When starting, if the engine does not fire within 10 seconds, check for something wrong; do not deplete the battery. After starting, note that the starting contactors are not stuck. The routine check of oil and water levels, pressures and temperatures before leaving the termimal may forestall trouble on the road. Know that all engines respond to power when the throttle is moved one or two notches and that all hand brakes are released before moving. Do not move the throttle above the fifth notch to speed up engines for increased compressor output when the locomotive is standing.

Locked Wheels

A defective or overheated traction motor armature bearing is apt to lock the wheels. Slid flat wheels may result in damage to rails and possibly in derailment. At station stops where time permits a member of the engine crew should inspect trucks and familiarize himself with normal temperatures of bearings. If an armature bearing is found to be heating enroute, reduce speed and remove the load by shutting down or idling the power plant driving motor. Set out the defective unit if it cannot be operated to a relief point. A locked wheel can sometimes be freed for low-speed movement by moving the locomotive back and forth. Otherwise it can only be freed by burning off the motor pinion or the drive gear on the axle, but only for restricted movement.

A heated traction-motor axle support bearing should receive additional oil and packing if necessary. Remove load from the bearing by moving the engine-control switch to "idle". The train may then move, observing the bearing frequently. When an engine is isolated by placing the engine control switch in "idle" position the wheel-slip indicator for the motors driven by that power plant is also inoperative, and extra care must be taken to observe the bearings enroute.

Train Delays Due to Diesel Failures

A report by a committee of which T. J. Conway, fuel supervisor, Texas & Pacific, was the chairman, described a number of failures involving governors, load-regulators, lube-oil-pressure protective devices, fuel pumps and temperature control devices. Governors, the report said, must have the proper oil level. Low or high oil level will cause the engine to hunt and may cause it to be shut down and sound the low-pressure alarm. The remedy is to correct the governor oil level.

Slow governor response because of too heavy oil causes difficulty in transitions between No. 2 and No. 3, both up and down. The remedy is to use lighter oil.

Follow instructions with respect to starting an engine after a governor safety-control shut-down. Failure to do so in a case where the engine shut-down was caused by a hot connecting-rod bearing, led to throwing of the connecting rod.

On E.M.D. GP-7 locomotives which have a "teaser" circuit for switching there is a L.R.S. switch in the load-regulator housing. Sometimes this fails to operate, hanging in mid-position and depriving the generator of excitation. Tapping on the housing or moving the switch by hand will save an engine failure.

The low lube-oil-pressure protection device on Alco-GE locomotives consists of two pressure-operated switches. One reduces the engine to "idle" at a certain pressure drop and engine speed; the other shuts the engine down if the pressure drops low enough. If the first switch opens, a failure may be saved by turning the engine control knob to Run 4 position. If there is an actual loss of lube-oil pressure the engine crew cannot correct it on the road.

Most fuel-pump troubles are beyond correction by the engine crew. However, if the pump stops, check for a loose cable connection at the pump motor. If this is the cause, it is readily

remedied. Fuel pumps sometimes stop because the drive shaft coupling becomes loose.

Tighten the Coupling Set Screw

Failure of temperature-control devices should seldom cause delays. Practically all diesel locomotives have arrangements for operating the shutters and controlling the cooling fans manually. The temperature-control circuit on E.M.D. F-3 locomotives comes from and is protected by the fuel-pump motor circuit. A blown pump-motor fuse was caused by a faulty a.c. contactor. This could have been isolated by tripping the a.c. contactor overload reset button on one contactor at a time until the faulty one had been found, with the loss of no more than four fuses. In this case the blown fuse was repeatedly replaced until all 10-amp. and 15-amp. fuses on the locomotive had been used up, with the loss of the unit.

The report listed a number of operations performed by the engineman which can cause damage if they are improperly performed. These are essentially the same as those listed in the report on improper handling of diesel locomotives.

Aiding the Crew to Locate Trouble

As crews have become familiar with diesel locomotives, delays caused by blown fuses and tripped circuit breakers have become less frequent. The committee suggests that crews can be assisted by properly identifying each starting contactor, ground relay and battery-charging ammeter and by stenciling a list of such apparatus on the door of each cabinet in which it is housed. Other suggestions involve a relay alarm bell circuit which warns of a tripped circuit breaker on a battery-charging circuit, and the raising of ground-relay actuation to 500 miliamps by connecting sufficient resistance in parallel with the relay coil. This has improved reduced unnecessary functioning during snow storms and heavy rains.

The report closes with a summary of the more frequent types of equipment failures examples of which are contained in a list of 71 cases of failure or delay attached to the report. These are control jumper failures, stuck braking and power contactors, and interlocks in control circuits out of line or dirty.

Improper Handling of Diesel Locomotives

A committee, of which R. R. Rich, road foreman of equipment, Chicago, Rock Island & Pacific, was chairman, presented a list of steps in the operation of diesel locomotives, from starting the engines to stopping the train, which are frequently mishandled by enginemen.

Starting the Engines

When starting a cold engine the test cocks should be opened; if there are none, listen carefully for unusual sounds and release the starter button immediately if they occur. Hold the lay shaft in no-fuel position for a few turns. Starting with water in the cylinders will cause serious damage. Let the fuel pump run a few seconds before starting the engine, but not long, which might cause fuel to leak into the cylinders, resulting in loss of lubrication, premature ignition and dilution of lubricant in the crank case. If engine does not fire within 10 or 15 seconds release the starter button and check to see that necessary switches are all closed and that no fuses are blown in the fuel circuit. Do not use the starting button to inch the engine over; the points will arc and pit. Do not start two engines from the same circuit at the same time. This will result in a blown fuse.

In early diesel locomotives the low-oil-pressure alarm is inoperative unless the isolation switch is in the run position. Do not leave the engine until the oil pressure has built up at least to the minimum. Cooling-water level should be rechecked after the engine has been running a few minutes; there may be an air lock in the system. Permit engine to idle long enough to build up air pressure to 70 lb. Power contactors will not close and brakes will not operate without air pressure. Temperature should reach 125 deg. F. before operating the locomotive. Oil-operated controls will not respond to cold oil.

Starting the Train

In charging the brake system of a train the throttle should be operated in the lowest notch which will maintain a main-reservoir pressure between 110 and 130 lb., in no case above the third notch.

If the train does not start in the high throttle notch, reduce the throttle to Number One notch and pause there long enough to permit the engine brakes to be applied to prevent back lash of gears when the throttle is moved to Idle. This also prevents heavy arcing when the power contactors are opened. When pumping air with the generator field switch open, on some locomotives the load regulators will assume a position corresponding to the throttle position. After reducing the throttle, closing the generator field switch and placing the reverse lever in a running position, sufficient time must be allowed for the load regulators to return to minimum field before advancing the throttle; otherwise the locomotive will move with a surge of power which may damage draft gears. This will also happen if the field switch is closed when the reverse lever is in position and the throttle open.

Bad Practices on the Road

Do not use sand while the wheels are slipping. This is a common cause for the failure of traction-motor pinions and axle gears. Excessive use of sand contributes to the accumulation of dust in traction motors, leading to high-voltage grounds and generator flashovers. Operate the transition lever strictly in accordance with the transition meter. This is particularly important when speed is reducing on up grades. Reduce the throttle on all diesel locomotives before passing over a railroad crossing. Time this so the load control will be operating in minimum field as the wheels cross. Do not stop trains with the throttle open. Close it at least 100 ft. before the stop, make a final brake-pipe reduction and allow the engine brakes to apply. This will prevent the rebound of the locomotive and back lash of the gears. Do not exceed specified speed limits and thus avoid overspeed damage to the motor armatures.

While the locomotive is in operation it is important to maintain a uniform engine temperature. The ideal is 165 deg. F. This may be varied by plus or minus 15 deg.

In yard service reversers are sometimes mishandled. The reverse lever should never be changed until the locomotive has come to rest. There have been cases where enginemen in local service make flying switches by opening the generator field switch to unload the engine with the throttle in fifth or sixth notch and later closing the switch without closing the throttle. This produces a heavy electrical load and will, no doubt, lead to trouble.

Train Handling

This report, which was prepared by a committee of which T. H. Bickerstaff, general supervisor air brakes, A. T. & S. F., was chairman, covered the entire range of train handling, including the manipulation of the throttle of diesel-electric locomotives, the braking of trains and the stopping of trains, both passenger and freight.

The instructions for starting passenger trains apply to E.M.D. EA7 or E8 locomotives and emphasize the importance of pausing about three seconds between throttle positions as the throttle is advanced or reduced and, in closing the throttle before taking slack, to hold it on No. 1 position long enough to let the amperes on load meter reduce to 200 before moving to idle.

In braking or stopping passenger trains, initial brake-pipe reductions are 8 lb. After the exhaust ceases the throttle is moved to No. 1 position. If speed is to be reduced to below 30 m.p.h. it should be moved to "idle" position. For stops from high speed, reduce the throttle to No. 3 position, make an 8-lb. brake-pipe reduction, close the throttle to idle and make the further reductions necessary to reduce speed to 12 to 15 m.p.h. when 400 or 500 ft. from the stopping point. Complete the stop by making a graduated release. For each graduation brake-pipe pressure should be raised not less than 4 lb. Graduations should cease when brake-pipe pressure has been restored to within 10 lb. of standard. Avoid the necessity of making a reapplication; this will produce a rough stop.

Dynamic Braking of Passenger Trains

When dynamic braking is to be used close the throttle to idle and hold the transition lever in No. 1 position for at least 10 seconds before moving to "off" position. Then move to "B" for 5 seconds and then to maximum braking. On long grades apply the train brakes with light reductions until the desired retardation has been produced, starting with maximum dynamic braking. When a speed reduction of 15 m.p.h. or more is to be made on level or light grades start with an initial brake-pipe reduction. When the exhaust port has closed apply the dynamic brake and make further brake-pipe reductions if necessary. If retarding force is still needed on releasing the train brakes, move the transition lever to "B" position, release the train brakes with light graduations, allow time for the slack to close, and increase the dynamic brake as needed. When stopping do not use the dynamic brake below 15 m.p.h. Move transition lever gradually to No. 1 position and stop with the train brake after slack has adjusted.

Electro-Pneumatic Brakes

The report sets forth five outstanding advantages of electro-pneumatic brake operation as compared with automatic brake operation. These are (1) the brakes on all cars and locomotives are applied simultaneously; (2) full service is obtained on the entire train in from 2 to 4 seconds; (3) brake-cylinder pressure can be graduated up or down at will; (4) on mountain grades the brakes can be cycled on and off without using retainers because the brake pipe and reservoirs are charged at all times; (5) brake-shoe wear is reduced at least 30 per cent as compared with the automatic brake. Some form of antiwheel-slip is necessary to insure reasonable freedom from wheel sliding when high cylinder pressures are used. Sanding equipment has also been found desirable to restore slippery rail to near dry-rail condition.

The most prevalent defect has been failure of a train-line circuit due to grounds or broken wires. Open circuits are generally caused by defective or loose connectors between cars.

In the discussion of handling passenger trains the question of taking slack in starting passenger trains was raised. The practice on the Seaboard was described. With trains of 800 to 1,000 tons on level track, the locomotive is reversed and the slack taken for a few cars and the train stopped without applying the brakes. Then the train is moved ahead. Spotting passenger trains at station platforms where the train is much longer than the platform requires a slow approach. Two roads whose practices were described in the discussion release the brakes a few seconds before the last application, then depend upon a single blast of the signal whistle from a trainman for the final application to spot the train. To make a smooth stop the signal is given on one of these roads about three car lengths before the spot at which the stop is desired. Another road drags the train into the station at slow speed with a light brake application and stops merely by closing the throttle. A question was raised as to whether the prerelease of brakes just before the train comes to a stop is good practice with trains of more than 12 cars. The Seaboard prereleases successfully with trains of 18 cars and more on the level part of the line. At the northern part of the line such trains are stopped with about 10 lb. pressure in the brake cylinders.

Starting Freight Trains

After the brake valve has been placed in release position allow from two minutes with trains of 60 to 80 cars to six minutes for trains of over 140 cars. It is seldom necessary to take slack to start a freight train with a diesel locomotive. Place the transition lever in No. 4 position with automatic transition and in No. 1 position with manual transition. Open the throttle to the position necessary to start the train, holding in each position about two seconds. Use sand continuously. If starting with two locomotives, allow the first locomotive to nearly stall before aiding with the second. After the locomotive starts keep the train just moving until the slack is all out, then advance the throttle as required.

Stopping Freight Trains

The initial brake-pipe reduction on freight trains should be 6 lb. After slack is adjusted make further reductions, the total to be not less than 15 lb. for trains up to 80 cars and 20 lb. for trains from 80 to 125 cars. On mountain grades where retainers are used special instructions apply. The brake-pipe exhaust should be open when the train stops. Do not release train brakes (a) when forward part of train is descending and rear is ascending or on level track; (b) when rear part is on curves; (c) when loaded cars are near the front and empties at the rear, and (d) when brake-pipe leakage is excessive.

If the train is stopped by a service application from the rear while the dynamic brake is applied, when the engineman sees the brake-pipe flow indicating light or feels the train dragging he should prevent the locomotive brake from applying. When the speed is reduced to 10 m.p.h. he should apply the locomotive brake to 10 lb. cylinder pressure and move the transition lever to No. 1 position.

Mountain Grade Braking

In mountain grade braking one of the first and most important considerations is conditioning of the cars in the train for the descent of the grade. This includes a test to determine that air brakes operate properly during service applications, to determine existing piston travel and make necessary adjustments, to determine leakage in the system, to determine that retaining valves and related piping are efficient and that brake shoes are of sufficient thickness to withstand the work required and the heat they will be required to dissipate in controlling train speed.

There is also the necessity for certain rules and special instructions regarding the use of retaining valves on descending grades. This varies considerably with the per cent of grade, length of grade, proportion of loads and empties in the train, whether loads are light or heavy, and on the type of motive power used. Speed on the grade must be low enough that heavy applications will not be necessary to control speed, and that the pressure retained in the cylinders will control the speed while recharging the system. Before beginning the descent of heavy mountain grades, the brakes must be applied and released to see that they are operative throughout the train. If the train must stand for some time after this test, it must be repeated to insure that an angle cock has not been turned or the brake pipe frozen in severe winter weather.

In winter weather the brakes should be applied soon after starting and while working steam or power to free the brake shoes of frost, snow or ice before the entire train enters on the descending grade. Keep the speed low so that a brake application will not be necessary before the greater portion of the train is on the descending grade.

The short cycle method of braking has been found to be the most successful on grades where retaining valves are used. This method results in the maintenance of uniform speeds and auxiliary reservoirs can be kept charged to near maximum pressure, and braking power and wheel temperatures are uniformly distributed.

The locomotive brakes and hand brakes if necessary must be used to hold a train when stopped on a heavy grade, thereby permitting the release of the train brakes and recharging the brake system. If the locomotive is to be detached from the train the air brakes should be released, then, beginning at the lower end of the section to be left standing, enough hand brakes should be set to hold the train. After recoupling, the brake system must be recharged before the hand brakes are released.

If a train should part on a heavy descending grade, hand brakes should immediately be set on all sections of the train before closing the angle cock on the portion attached to the locomotive. Then the air brakes may be released and the system recharged. After recoupling, the brake system must be recharged before the hand brakes are released.

During the discussion of freight train handling a question was raised as to how to use the transition levers on a two-unit locomotive one unit of which has manual transition and one, automatic transition. To get transition throughout the locomtive, transition would have to be operated with the transition lever.

Exception was taken to taking one foot of slack, as suggested in the report, say on a 150-car train, as being hardly worth considering. One speaker said that if slack is to be taken it ought all to be taken. It was pointed out that the locomotive has sufficient traction to start almost any train, but the question is whether the draw bars would stand that kind of a start. With the slack taken and starting the train one car at a time it would be impossible to pull a drawbar. Another speaker opposed taking slack back to the caboose. If the caboose moves that is a backup movement, of which the crew has no warning. This speaker advo-

cated setting the brakes while the train is still standing, then reverse the locomotive, place the brake valve in position to release the brakes at the head end, open the throttle and shove the slack back (one car length will take the slack of 50 or 55 cars) but not to the caboose. Then set the locomotive brakes, release the train brakes, set the reverse lever in forward position, start the sanders and increase the throttle progressively.

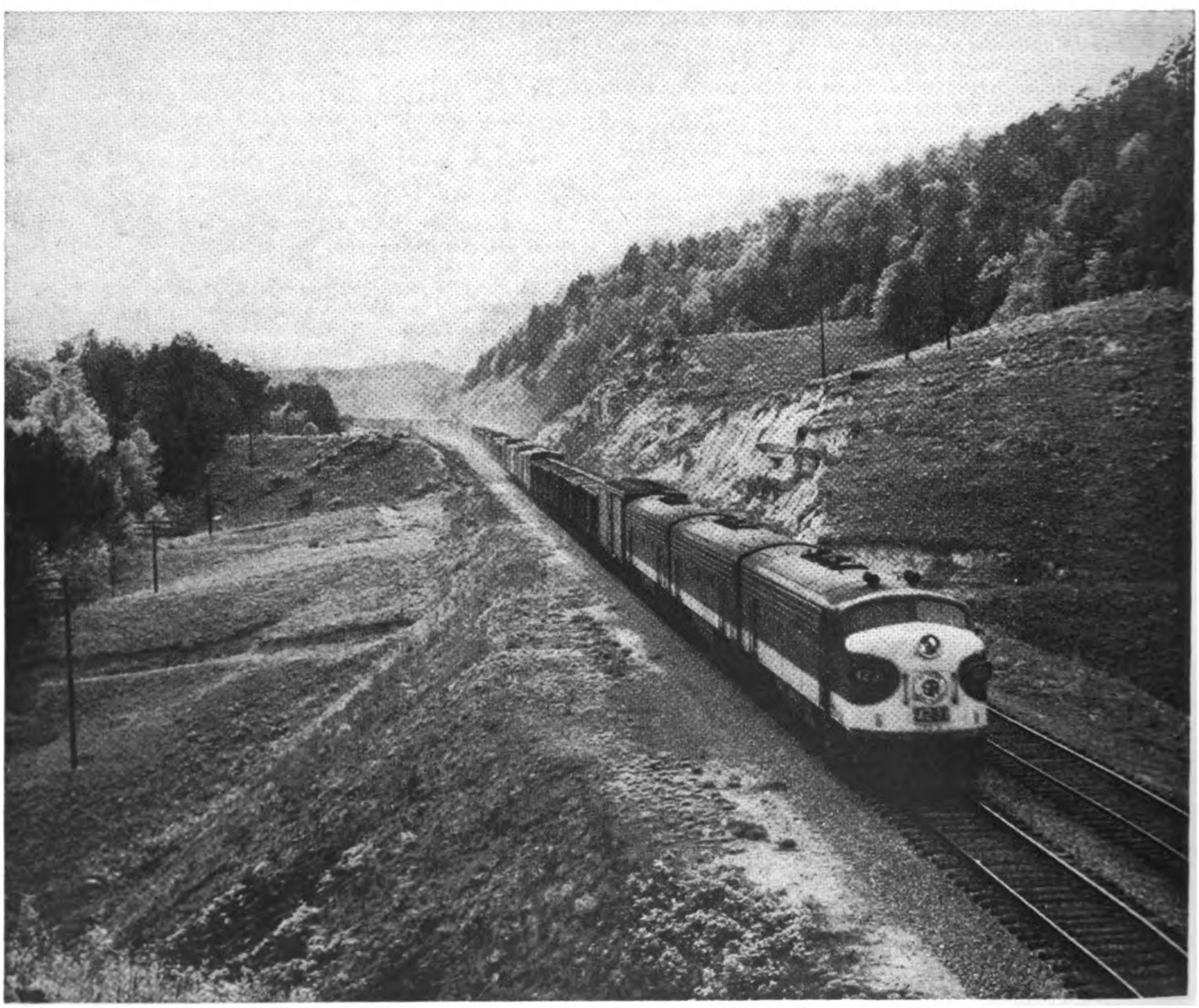
Allowing six minutes for release of brakes before starting a freight train and keeping a train moving slowly for three car lengths were both questioned from the floor. The time, it was said, might be too long or it might be too short, depending on the length of the train. With respect to the second point, the members were reminded that some roads are handling up to 190-car trains.

In the discussion on stopping freight trains, it was pointed out that prohibiting the release of the brakes at speeds below 10 m.p.h. is the rule on one road, but that the limit is 20 m.p.h. on another, 30 m.p.h. on another, and 35 m.p.h. on still another, and that the rate of retardation determines how low the safe speed may go. One speaker warned that in developing rules for the use of the dynamic brake on grades it should be remembered that it can fail, and that contingency should be covered in the rules.

In considering whether stops should be made with the slack stretched or bunched, one road makes no attempt to stretch a train of over 75 cars. On longer trains the brake-pipe gradient is such as to cause, first, a run in of slack, followed by a slight run out. Six conditions were named which have to be favorable if stretching can be done effectively. They are (1) the majority of the loads should be in front; (2) piston travel should be uniform; (3) the brake-pipe gradient should be within 3 lb.; (4) brake applications from front to rear should not take over 5 seconds; (5) the speed should not be over 25 m.p.h., and (6) the profile should be favorable.

Undesired emergencies are occurring with AB brakes. The question was asked what could be done, after an undesired emergency had occurred when a first-service reduction was being made, to avoid a repetition when the next brake application had to be made. One road finds that to let the brakes apply by brake-pipe leakage will usually avoid a repetition.

In commenting on the minimum reduction of 12 to 15 lb. advocated in the report, one speaker said that the release-insuring valve of the AB brake prevents the brakes sticking no matter what the engineman does, but another questioned depending on this valve to permit lighter reductions because many brakes have been in service for nearly 36 months.



Diesel Maintenance Holds Attention of L. M. O. A.

S. M. Houston,
First Vice-Pres.
(Assistant general superintendent motive power, Southern Pacific)

H. H. Magill,
(Superintendent motive power, C. & N. W.)

F. D. Sineath,
Second Vice-Pres.
(Assistant general superintendent motive power, A. C. L.)

Addresses, reports and discussions indicate that railroads are now trying to perform a big electrical maintenance job with too few facilities and inadequately trained personnel

Once again the Locomotive Maintenance Officers' Association led in registrations and attendance at the Chicago meetings, indictating an interest on the part of mechanical men in discussions and reports that will simplify their maintenance and servicing problems, whether it be in terminal or general repair shop. H. H. Magill, superintendent motive power, C&NW, presided at the opening session each day and introduced the chairmen of the several sessions. The L.M.O.A. program for the three-day meeting embodied reports on personnel training, shop tools, diesel engine oil leaks, crankshaft and bearing failures, a report on wheel slip, an electrical committee report on the causes of flashovers, a report on reclamation and the control of materials and a report of a committee on the determination of diesel facilities for small, medium and large roads. The latter report appeared in the

T. T. Blickle,
Third Vice-Pres.
(Mechanical superintendent Coast Lines, A. T. & S. F.)

J. T. Daley,
Fourth Vice-Pres.
(Superintendent motive power, Alton & Southern)

C. M. Lipscomb,
Sec.-Treas.
(Assistant to schedule supervisor, M. P.)

October issue of *Railway Mechanical & Electrical Engineer* (page 77) and the report on flashovers and their causes also appeared in last month's issue (page 87). All other reports except wheel slip, reclamation of diesel parts, diesel locomotive cleaning and a paper on Improving the Performance of Steam Locomotives, which appeared in the *Railway Age* for September 29, 1952, page 51, are abstracted along with the discussion, if any, in this issue.

The association was addressed by W. J. Patterson, member of the Interstate Commerce Commission and by Edward H. Davidson, director of the Bureau of Locomotive Inspection, I. C. C. Abstracts of these addresses appear elsewhere in this issue.

President Magill, in his opening remarks, paid tribute to the many members who, by their work during the year, contributed to the success of the meeting and in conclusion said, in part:

"This meeting presents the greatest challenge and opportunity we have ever had for service to the industry. With the ever increasing number of diesel units being placed in service, thousands of apprentices, mechanics and supervisors remain to be trained; our men continue to injure themselves or each other, oil leaks, crankshafts and bearings fail, material costs continue to climb, and at the same time, valuable and expensive and much needed motive power is held out of service for comparatively insignificant repair parts, diesel tools need to be standardized, secured, kept and cared for, diesel locomotives and the parts need to be cleaned and kept clean, steam locomotives need to be maintained and utilized to fullest efficiency until replaced by diesel power, diesel facilities need to be built to save money today and tomorrow, diesel wheels continue to slip with enormous damage to the equipment and interruption to service, team work in safety, performance production and a program of planned conservation of materials through reclamation is needed now as never before and last but by no means the least problem, traction motors and main generators continue to flash, contributing greatly to our maintenance costs and interrupting our service."

The officers elected to serve during the coming year appear in a list shown on page 122 of this issue.

How To Stop Oil Leaks

Oil leaks came in with the first diesel-electric locomotive. While fuel oil leaks have been troublesome, the main concern is lube oil leaks.

Every railroad has several types of power, some of which are worse offenders than others. The leaks accumulate and spread over the floor creating a hazard for anyone working in or passing through the engine room. On occasion the oil seeps through the floor onto the running gear and finds its way into electrical junction boxes and terminal strips, causing various kinds of electrical disturbance and deterioration of insulation. Some roads have even built dams around the engine by welding strips to the floor. This confines the oil and keeps it off the passageways but does not correct the leaks. One road found it necessary to hire additional help to clean the engine room at specified service points enroute to prevent the accumulation of oil. These leaks have also increased the labor and time involved in the cleaning of the trucks and underframe at final terminals.

Leaks on small covers and inspection plates are sometimes the result of improper application, but more often short gasket life is at fault. While it is a small job to renew gaskets on many of the inspection covers, it is on those covers which are removed periodically that improved materials are needed. We ordinarily think of an inspection cover gasket as a trivial item of expense, but records of one road alone show an issue of 64,000 in one 12-month period, representing $10,240 at $.16 each on just one type of gasket.

The smaller gaskets can be readily renewed but those leaks which occur between the crankcase and oil pan and housings at both ends of the engine are costly and to repair properly, requires complete engine rebuild. Progress has been made by applying additional and higher tensile strength cap screws and improved gaskets. This modification involves templates and redrilling of the block and housing which, of course, is better done at time of heavy repairs or major overhaul period. Some roads are also sealing the joints on the outside and those engines having had this treatment are leak-free at the reworked joints. This procedure enables shop forces to correct the more costly leaks without dismantling the engine but requires about 48 out-of-service hours per engine. Each joint is properly calked and cleaned, then two coats of a special primer are applied with one hour drying time allowed for each coat. The special sealing compound is then applied with a 1 in. by .010 in. fiberglass tape placed over the joint and between the two coats of sealing compound. This entire application is then allowed to dry for at least 36 hours. The results of this method have been encouraging.

Additional cap screws will better equalize the various flange loading and permit greater torque values resulting in tighter joints, less movement of the flange surfaces, and longer gasket life. Another remedy for the leak between oil pan and crankcase consists of a machined groove running the full length of the oil pan on each side into which a silicone cord is placed. The cord is compressed and forms an oil seal at this joint.

A design change made on Type 567C engine, not yet in production, is the top deck and cover change which affords a better seal at the cover. The top deck cover is now hinged to the back of the top deck frame and carries a Neoprene seal against the flat surface of the frame when the cover is closed and latched. This design has also reduced the number of gasketed joints at the generator end, which, of course, will reduce the oil leaks at that end of the engine.

While external oil leaks have been stressed, some thought should be given to internal oil leaks. Leaks of this nature are mostly invisible and, in many instances, their presence is not known until damage has been done. These are often caused by breakage of rigid lines brought about by expansion and contraction within the engine and vibration. The early Type 567 engine with the rigid oil lines in the gear train needed continual repairs until the manufacturer developed the slip joint oil line. Only after flexible lines were applied between fuel oil manifold and pump could breakage and fuel leaks at this point be stopped on the Type 244B engine. Where possible, flexible lines should be employed where vibration is present and alignment difficult.

The above is an abstract of a report made by a committee of which J. W. Luke, general supervisor of diesel engines, AT&SF, was chairman.

Discussion

With reference to building dams around engine base to prevent oil from running out into the passageway one road reported that while it had done this the ICC inspectors did not look upon this as a satisfactory solution. Another member raised the question as to the availability of plastic or liquid gasket compound which would resist detergents used in lube oil. A committee member pointed out that compounds should not be relied upon to stop leaks entirely but that the gasket and the companion surface are the important factors in leak prevention. One builder's representative mentioned the use of crankcase vacuum in one series of engine which has been found to minimize oil leaks. Another speaker, however, said that an improper amount of vacuum in the crankcase might easily give rise to dangerous conditions.

Crankshaft and Bearing Failures

Crankshaft and bearing failures are so closely related that it is seldom we have one without the other. Any consideration of change of one involves the other; in fact, the two are generally considered as a unit

Changes in operating conditions and increased horsepower demand presents continual problems with bearings and crankshafts. As one requirement is met, another is introduced in the continual quest of more horsepower per engine. While these required changes are primarily design changes and the manufacturer's responsibility, the railroads are receiving more and more different types of equipment which require a never-ending stream of parts and material—few of which are interchangeable. This, in turn, increases the chances of mistakes by the mechanics in the shops as well as the amount of stock which must be carried at any one point. We realize these changes, some of which are improvements, are natural progress which the railroads would never deny but the ultimate goal of every manufacturer should be interchangeability of component parts on the

many different locomotives being sold to the railroads today.

Lubricating oil is also closely related to the crankshaft and bearings and cannot be ignored in any discussion of these failures. Any change in the engine horsepower causing an increase in bearing load must have an oil of sufficient film strength to maintain adequate lubrication between the bearing surfaces. With the changes in the many lubricating oils to the present day additive and non-additive greater strength oils, we have a problem of emulsification with water which has changed our entire maintenance setup. Because we do have water leaks into the lubricating oil and because this water mixes with the oil to form an emulsion, we have had numerous crankshaft failures. With improved materials, engines, and lubricating oils, water in the lube oil is indeed a headache. We have had to set up elaborate checks at strategic points to determine the presence of water in lube oil. It is apparent that if the railroads are to be denied a lubricating oil not susceptible to water they must have engines free of water leaks.

Crankshaft losses are sometimes the result of piston, liner, or connecting rod failures. Rrecently, one road was testing cast iron pistons as a replacement for aluminum pistons and subsequent failure damaged the crankshaft beyond further use. In an obvious effort to hold the weight of the cast iron piston close to the weight of the aluminum piston, the design resulted in structural weakness which allowed the piston to be pulled in two when seizure occurred. The tin plating on the piston walls peeled off and closed the pores in the liner which also contributed to the seizure. In cases where a piston has broken allowing the upper end of the rod to whip around inside the engine and those cases of broken connecting rods, either the engine block or crankcase, or both, are severely damaged.

From time to time, bearings are often changed because of material shortages and again because new materials or methods have been developed which, on test, appear to be superior to the bearings already in use. The changes oftentimes make a favorable showing under test in the laboratory but when placed in actual railroad operation, failures develop which heretofore had not been considered. As bearing changes or any design and material changes are made, it is felt the laboratory tests are not of sufficient duration or the conditions under which the tests are conducted do not approximate actual railroad operating conditions. Too many times a new product or change is introduced and heralded as a major improvement only to fall short of the manufacturer's claim after it is adopted by the railroads.

During the test stage of any new development, that part of the equipment under test should be made to operate in snow, ice, sand, dust, and every conceivable combination of conditions which are encountered in actual railroad operation. Too often the proving ground is a clean, air-conditioned building where the equipment is protected from the elements.

Each new bearing generally bears a new part number, particularly where a new vendor is involved. This adds to the confusion in the various shops and store departments where we are faced with hundreds of these number changes each year. The net result is loss of valuable man hours in proper identification and, in some cases, improper bearings are placed in an engine. These bearings should be properly and easily identified and where more than one number is involved, that both numbers be carried on the bearing with the latest number also identified. Many man hours have been lost because a certain bearing, with a new number, has been delivered to the shop and they have been unable to identify or determine which bearing has been superseded.

If the bearing troubles do level off and we can relax for a moment, notice is suddenly received that all bearing of a certain series, made between certain dates or having certain characteristics, are subject to failure and should be removed from all engines and storehouse stock immediately. Once again we start through the engines to remove all bearings that fall in that category. Each time a bearing is disturbed, the human element enters and chances for failure are increased. It is difficult to keep experienced men versed in all bearing applications on this types of work and therefore, improper application or the use of a faulty bearing is a possibility. It has always been the contention that the less handling and the least number of inspections during the life of any bearing is most desirable. Other roads, no doubt, have had experience in that an engine performed satisfactorily until some inspection or work was performed on the engine and thereafter trouble was immediately encountered.

The service of each bearing and experience teaches what inspections are necessary and what life to expect from the bearing While credit should be given where credit is due in the development of improved bearings, the railroads have certainly been the guinea pigs in the major portion of these developments.

The last of the large manufacturers has now changed from a hand fitted to a precision-type bearing. This change involved the use of a bearing with no shims between the halves but required accurate and permanent shims applied between cap and bed plate. With our modern operation with high availability, hand fitted bearings are not desirable. Bearings which can be replaced by merely rolling one out, rolling another in, and retightening the cap with no adjustment of shims, are most acceptable to all roads. Having the upper and lower bearing halves interchangeable is another advantage.

The lead babbitt, aluminum, and the tri-metal bearings are the most common but tri-metal, due to its increased cost, need not be used where the bearing load does not justify the harder and more expensive bearing; namely, switch power. A gridded bearing was tried on two type of power prior to the acceptance of the tri-metal bearing, but failures occurred on this bearing soon after their application. Those bearings in the road power were immediately removed but it was found we could get a year's service out of this bearing in our switch power. Although the use of the bearing was discontinued, those already on hand are being used in certain specified engines for one year only, after which time they are removed and scrapped. The few switch engines now using this bearing have the large capacity lube oil pump as the greater running clearance of this bearing demands a greater oil supply.

We insist on steel-back bearings for all engines where available for greater resistance to closure as our experience with the bronze-back bearing has been none too favorable. By far, those bearings rejected during an inspection period have not been for wear but for shelling and flaking. Any signs of bearing metal in the crankcase or on the oil filters, prompts an immediate bearing inspection. What we have considered for years as poor bond between the metal in bearings has, in many cases, now been shown to be oil corrosion. Facts and tests have definitely proved that some oils are much more corrosive than others to the lead in present day bearings. As a simple test, 10 gr. of granular lead and 300 gr. of test oil were placed in a beaker and heated to 225 deg. F. for 40 hours. The oil was then poured off and the lead washed and weighed, from which the weight loss was calculated. Of the four oils tested, there was no loss in weight in two cases, but with the other two oils, there was a 20 milligram loss with one and an 8 milligram loss with the other. From this and other similar tests, it certainly seems an investigation by the oil companies is indeed warranted.

An entirely new field of faulty bearing detection has now been opened by the use of the spectrograph. This instrument, while a common tool to the metallurgist and the laboratory scientist, is but about a year old in its application to oil analysis of the diesel engine. Those roads which have this instrument feel it has a place in diesel engine maintenance. The high initial cost, together with the operational cost, has made many view this procedure with skepticism. However, there has been case after case where spectrographic analysis has detected trouble in the engine 30, and even 60 days, in advance of the failure. At the present time, it appears that a standardization of procedure is needed if the results of one operator are to match those of another. As more experience is gained, both in the operation of the spectrograph and the interpretation of the results, a standard of operation for all makes of diesel engines may be set up from which future maintenance can be based.

Crankshaft Misalignment

Misalignment of the shaft has never been too great a problem although trouble was experienced with two or three new engines continually wiping out the mains because of misalignment of shaft. These cases were soon corrected by the manufacturer and no further trouble was experienced. Generally speaking, the engine A-frames have been reinforced on all engines to the point where bed distortion has been kept to a minimum. However, as the engines become older and where welding has been done adjacent to the bearing supports, the question of alignment again

arises. There are also opinions that any engine after three or four years of service is subject to misalignment due to temperature cycles as there is a tendency for the metal to grow. If this condition does exist, it appears engines should be rebored after about five years of service to insure crankshaft alignment and full bearing life. This, of course, will require a thorough investigation. Once a main bearing fails and excessive heat is involved, the main bearing fit closes which necessitates the line boring of the entire block. This is expensive and on those roads not equipped to do this work, means the crankcase must be returned to the manufacturer for reboring.

Crankcase bearing supports are rebored in our shops at San Bernardino with very good success. Some supports are welded where necessary and the boring bar of our own design is used for this work.

Crankshafts have been made with as large main and crankpin journals as feasible to obtain the utmost in rigidity and to reduce the overall bearing load as much as possible. Experience has indicated that engines containing drop-forged, dynamically balanced crankshafts of low alloy carbon steel and induction hardened main and crankpin journals have given the best service. There has been little wear on these journals and the bearing life has been very good. One value of the hardening process was demonstrated quite clearly on those engines involved in the flood last year at Kansas City. The shafts which had been hardened were not affected by the corrosive action of the flood waters while those shafts not hardened were pitted at the journal surface. The hard journal surface further protects the shaft in some cases of bearing failure where the initial bearing surface has wiped out leaving the harder metal in contact with the journals. In fact, we have had a few cases where this took place and the bearing reseated itself with no damage to the crankshaft.

A recent change by one manufacturer to increase their horsepower rating was the enlarged diameter of main and crankpin journals. This new shaft requires thin main bearings and thin flangeless con rod bearings. Bearing trouble has already developed on this engine and the manufacturer and the oil companies are not in agreement as to the cause. It would seem that this case bears out my former statement that these changes are not subjected to the proper test before introduction to the railroad.

It is customary to reclaim crankshafts after they have been scored or overheated by grinding to an undersize providing no heat checks are present. We make no effort to reclaim any shaft which contains heat or thermal cracks. All crankpins are ground to the same undersize as are the main journals although both mains and crankpins need not necessarily be ground to the same size. We have a shaft in service which was repaired by the sleeve and hard chrome plating method and its performance is being followed closely. This particular shaft had previously been ground to undersize and the No. 4 throw was badly damaged. By normal standards, this shaft would have been scrapped; but by the sleeve and plating method, the damaged throw was first turned to remove all scoring and the sleeve applied. The chrome plating was then applied to give the desired hardness and the throw ground to match the remaining throws. We have another shaft in service from an eight-cylinder engine which was replated by the same method and returned to standard size. This has been in service eighteen months and is still giving good service. While the plating method has been used quite extensively, there are limitations at the present time to the plating thickness that can be applied to any one surface.

It has not been possible to establish a reasonable life on all types of bearings as some cannot be relied upon to give one year's service. However, it is the intention to set a life expectancy with a reasonable safety factor and at the end of that time, all bearings will be renewed. This will eliminate disturbing bearings for routine inspection as well as any controversy over whether the bearing is fit for further service and for how long. This procedure will use less bearings, eliminate guess-work in the inspection of bearings, and remove the human element of misapplication.

This report was presented by a committee of which J. W. Luke, general supervisor of diesel engines, AT&SF, was chairman.

Discussion

Considerable discussion took place after the presentation of the subject, most of which had to do with shop methods for the detection of worn shafts and bearings and the proper method of re-alignment during engine overhaul. It was obvious that many members are of the opinion that engine design has much to do with this type of failure and that unsatisfactory lubricating oils also are a major factor. Discussion of spectrographic analysis indicated no wide difference of opinion as to its value though the cost was questioned. A member, however, brought out that one road had brought the cost of this type of inspection down to an average of $50 per year per unit.

One builder's representative attributed much of the crankshaft troubles not so much to improper design in the engine as to misalignment in engines damaged in wrecks and the same speaker disposed of the lube oil problem by saying that as long as the railroads appear to need different types of oils for different engines it is a problem with which they must contend; that his company had established specifications for lube oil that function satisfactorily with engines built by his company and indicated that compromises in "specs" relating to oil lead to difficulty.

Shop Tools for Diesel Work

The subject, Standardization, Control and Distribution of Tools for Diesel Work, made up a report of a committee under the chairmanship of F. E. Molloy, assistant superintendent motive power, Southern Pacific, which consisted of two parts: one having to do with a list of basic tools needed at small running repair terminals and in general repair shops for machinists, electricians and sheet metal workers; the other a presentation of several devices developed by different roads for performing diesel repair operations. Of the latter group several are shown here with a description of their use.

Fig. 1 shows a piston Magnaflux table approximately 18 in. wide by 5 ft. long with a Micarta top. It provides for the inspection of the top of the piston, of the outside surface and of the inside of the piston.

The top of the piston can be Magnafluxed by placing the piston upright in the rectangular coil which is 10½ in. wide and 16 in. long. It is made up of three turns of 3⁄32 in. by 1 in. copper. The coil is 234 cm. per ampere. The coil is mounted on end so that the inner surface of the bottom is 1½ in. below the surface of the table. The arch form is at right angles to the table top.

The inspection of the outside surface of the piston is accomplished by laying the piston on its side and revolving it inside of an 11 in. diameter coil of 3⁄32 in. by 1 in. copper, three turns. This coil is also mounted at right angles to the table top and the bottom of the coil is about 1½ in. below the surface of the table top.

The interior of the piston is inspected by turning the piston upside down on a mesh electrode and inserting a prod electrode inside of the piston. The mesh electrode is made of three layers of copper screen No. 28 wire cloth, 50 mesh. It is approximately 10 in. in diameter and rests on ½ in. felt pad, which in turn rests on a base of Micarta. The three pieces of copper mesh are laid between two copper bus bars.

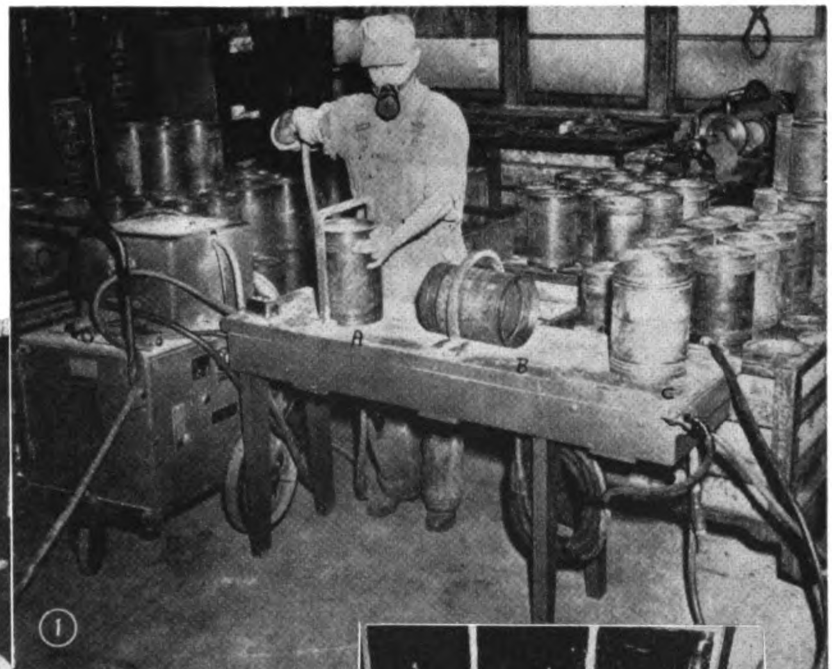
A conventional Magnaflux power unit provides the power required to magnetize the pistons for these three methods.

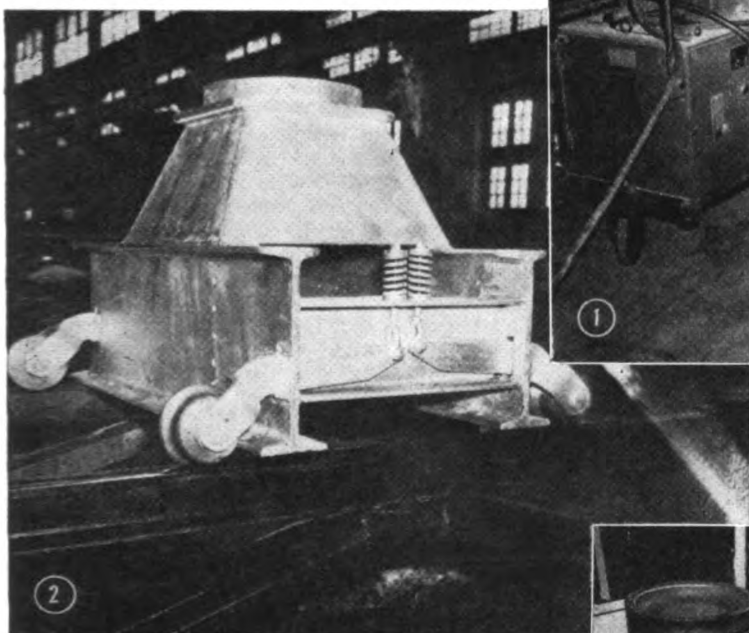
The two coils take about 500 amp. while the copper mesh and prod electrode use 2,000 amp., therefore, it is necessary to place a choke coil in series with both the rectangular and circular coils to limit the current. The choke coil is made of nine turns of No. 2-0 wire. The current to the mesh electrode must be turned off when the piston is placed on the electrode so as not to draw an arc. A Magnaflux inspection gun completes the necessary equipment.

Fig. 2 shows a pedestal support for locomotive body which is one of a pair of pedestals used to support a locomotive when the trucks are removed. The pedestal carries the weight of the locomotive in its natural position on the center bearing and is of the proper height for checking clearance, pilot height, etc. Suspending a locomotive on these pedestals allows the alignment of engine or main generator without having a twist in the frame. The clevis mounted wheels with special tension allow for easy movement on the rails for lining up with the center casting or moving from one location to another. As the weight of the locomo-

1—Special table for making Magnaflux inspection of pistons.

2—Pedestal for supporting locomotive when trucks are removed.

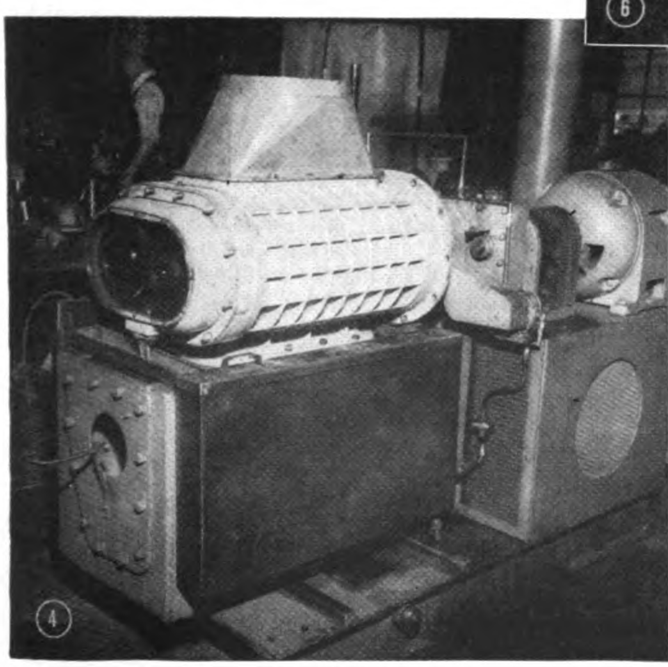


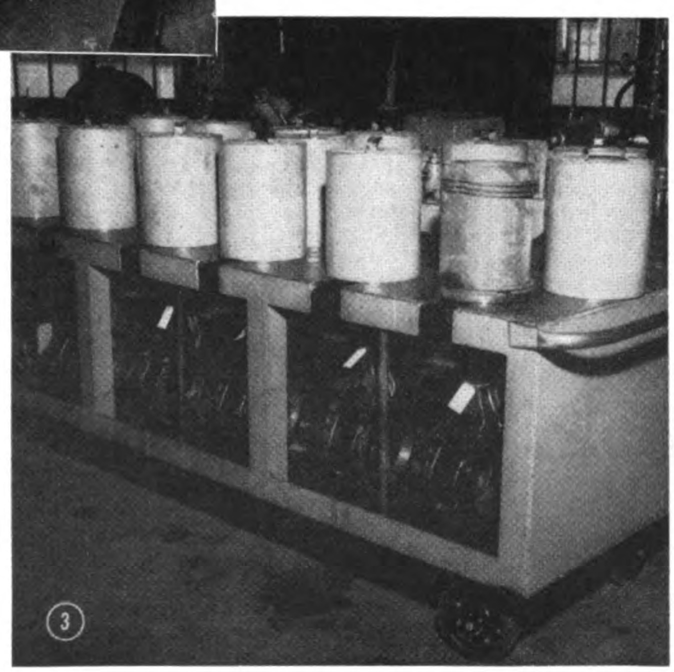


3—Rack for assembling piston and rod sets.

4—Test rack for checking condition of engine blowers.

5 and 6—Stand with mandrel for checking concentricity of pistons.





tive is set on the pedestal, the heavy I beams move down in contact with the rails.

The portable piston assembly rack shown in Fig. 3 was designed to hold an engine set of new or reconditioned piston and rod assemblies. Besides providing a fast and efficient means of transporting the assemblies from the assembly area to the engine, its use promotes cleanliness and good workmanship because the material to be installed is stored in a neat and orderly manner.

The test rack for engine blowers (Fig. 4) consists of an electric drive, oil pressure pump and tank and pressure measuring device. It can be used to check condition of blowers removed from engines at regular maintenance periods and to run in and test reconditioned blowers.

The piston checking stand (Figs. 5 and 6) consists of a heavy steel base plate upon which a mandrel, machined to fit the inside finished surfaces of the piston, can be revolved. A piston to be checked is placed on the mandrel and a dial indicator attached to a surface gauge is used to check the concentricity of the piston. When not in use a steel cover is placed over the mandrel to protect it from damage.

The concluding part of the report was a discussion of the value of systematic methods for checking and distributing tools to workmen in shops and terminals.

How Apprentices Should Be Trained

Before entering into a discussion of apprentice training we should first consider the necessity of a paper on apprentice training, because apprenticeship is not something new.

This paper deals primarily with the crafts that diesel power has affected, namely the Machinist and Electricians.

Need For Preservation

It is the recommendation of the Committee that apprentice training continue under shop management having direct supervision over the apprentice, because the training must be associated with the training procedures over which supervision is directly responsible. Apprentice training should not be subjected to any exploits, or experiments, but rather all that is necessary is that our present methods be altered to suit the need that has been brought about with the advent of diesel power.

Apprenticeships must be recognized as arts. To fix these arts in the minds of individuals, a well defined objective must first be established in the mind of the apprentice to be trained. The true values of apprenticeship can only be appreciated when the individual trained is able to evaluate the knowledge, or experience, progressively followed, which has been set up in a fundamental sequence, by a self analysis of his experiences which have instilled into him the ability to perform the work of the craft in which he has been trained.

The apprentices on the American railroads today will be the mechanics of tomorrow. The efficiency of industry will be reflected in the type of craftsmanship produced by the trained employee. Anything that would disturb the apprentice, brought about by unrest, or failure to recognize the valuable fundamentals to his training will only result in his failure.

Apprentice training must be recognized as designed to produce finished mechanics; industry needs skilled mechanics, and the individual needs to be trained. There is a common interest between the railroads and the crafts in the investment by the railroad industry in producing a skilled mechanic. There also should be a desire on the part of the individual to be properly trained to the end that an apprentice training system effectiveness will be reflected in a well trained mechanic.

Management cannot receive the services of a skilled mechanic unless the mechanic has been properly trained. The individual, or apprentice, cannot associate himself with an art without the necessary qualifications, and these qualifications can only be obtained through proper training. From these fundamental principles industry has progressed to what it is today.

It would take but a moment to see where we must apply a principle that will instill the basic fundamentals of training. The responsibility of management is to set up a procedure of teaching that will produce a trained mechanic. It is likewise true that the apprentice, when employed, after due process of screening and until the probation period is complete, has confirmed that the individual possess the necessary qualifications of aptitudes to apply himself to the arts of the trade, which will. if these factors are kept in the minds of management and the apprentice, result in a finished mechanic.

Training System

EMPLOYMENT

1. Careful Screening of all applicants
   (a) Education—Employing officer should be satisfied that the applicant's education is equivalent to the trade requirements. In most cases it would seem that a High School Education would be the minimum.
   (b) Tests—I.Q. test to determine mechanical aptitude.

(If screening method discloses the applicant suitable, a brief explanation should be made to the Applicant what his particular craft offers. This is considered very important. The Organization or Management of the apprentice system that he will soon enter should be thoroughly explained. It should also be explained to him what is meant by a probationary period, which is designed to prove his attitude as well as his aptitude, and that such a period is necessary to both he and the Management, since if the applicant should be allowed to continue as an apprentice when he does not have the right attitude or aptitude, it will result in an injustice to both parties.)

2. Probationary period—Should be well defined. Six months would be the recommended minimum.
   (a) Graded—to determine all angles relating to the responsibility of Management to the Apprentice, as well as the Apprentice to the Management. Such grades, if properly made will determine the industry of the individual as well as his attitudes and aptitudes.
   (Individual railroads should set up their standard grades that will pass or reject an apprentice.)
   (b) Placed with the best of mechanics. (Apprentices to be given a fair probationary period should be placed with the best mechanics. Apprentice instructors and supervisors should be diligent to apprentices in this probationary period.)
   (c) Meetings of supervisors and instructors in charge of Apprentices. (These meetings should be held periodically to discuss the progress of apprentices in order that the probationary period will be made effective and protect both the Apprentice and Management.

TRAINING DETAILS

1. On the job training
   (a) Work with mechanics and/or under the direct supervision of supervisor or instructor.
2. Classroom instructions
   (a) Classroom instructions should be sufficient to train the apprentice in mathematics, mechanical drawing, blue print reading, and free hand sketching.
      (1) Mathematics
      Exercise problems to check his mathematical aptitude on problems that are peculiar to the training for which he has been employed.
      (2) Mechanical drawing
      A minimum to teach him the rudiments of this subject in order he can correctly identify mechanical details reflected in blue prints, etc.
      (3) Blue print reading
      Sufficient lessons to check his knowledge of the subject.
      (4) Free hand sketching
      Considered to be highly important to be able to visualize and to illustrate ideas to expedite with handling, stimulate accuracy, and a means to transmit detail.

3. Reference Library—Wherever possible should be provided (Apprentices should be encouraged in supplementary education in connection with their apprenticeship, such as correspondence schools.)

The outline set up below is only a suggested outline, and the time periods on the various work procedures, set up as experience factors to teach the apprentice, by doing, will have to be fitted to the particular railroad's condition, while the outline furnished is designed to place an estimate on what will be required as fundamental to the apprentice's training periods.

Care should be exercised in starting the apprentice on the elementary phase of his training and schedules made up respecting the sequence from the elementary to the advanced. The outline we are submitting is a recommended time that should be spent on the various jobs in order that the above might be accomplished.

MACHINIST APPRENTICE TRAINING SCHEDULE

Unit Number	Unit	Time, hr.
1.	*Diesel Truck Repairs:*	520

a. Renewing wheels and traction motors
b. Traction motor repairs
c. Renewing wearing plates, springs & hangers
d. Brake rigging repairs
e. Truck frame
f. Welding, 50 hours
g. Machine work, 60 hours

2. *Tool Room:* 520

a. Repairs to small tools
b. Lathe work
c. Milling machine
d. Grinding machine

3. *Diesel Parts Reconditioning:* 1,040

a. Cylinder heads and valves
b. Cylinder liners, regrinding
c. Pistons, pins and rings
d. Connecting rods
e. Governor
f. Pumps, lube oil, water and fuel
g. Injectors and pumps
h. Blowers
i. Turbo-chargers
j. Machine work, 180 hours

4. *Machine Maintenance:* 1,040

a. Steam derrick
b. Locomotive cranes
c. Stationary boilers
d. Coal handling equipment
e. Pumps
f. Maintenance of way equipment
g. Welding, 150 hours
h. Machine work, 180 hours

5. *Steam Generator:* 520

a. Running maintenance
b. I.C.C. requirements
c. Operating and testing

6. *Drafting Room:* 520

a. Blue print files
b. Reading prints
c. Familiarization with engineering design problems and policies, board work
d. Free hand sketching

7. *Wheel Shop:* 520

a. Car wheel mounting and dismounting
b. Diesel wheel mounting and dismounting
c. Wheel lathes
d. Axle lathes
e. Magnaflux machine
f. Grinding machine
g. Wheel press

8. *Air Room:* 520

a. Repairs to all air brake equipment
b. All air appurtenances
c. Air compressor overhaul
d. Welding, 50 hours
e. Machine work, 60 hours

9. *Cab and Air Job:* 520

a. Running maintenance air brake equipment
b. I.C.C. requirements
c. Running maintenance air appurtenances
d. Air compressor maintenance
e. Machine work 60 hours

10. *Automobile Repairs:* 520

a. Automobiles
b. Trucks
c. Motor cars
d. Tractors
e. Bull-dozers
f. All gasoline engines, M of W tools and equipment
g. Welding, 100 hours
h. Machine work, 120 hours

NOTE: This item included since repairs to automobiles on some railroads are performed by the Mechanical Department, on others it is done by other departments. If this work performed by other departments, then this time can be diverted to other phases.

11. *Diesel Engine Over-haul:* 1,040

a. Disassembly and assembly
b. Rocker arms
c. Cylinder heads
d. Injectors
e. Pistons and connecting rods
f. Cylinder liners
g. Main bearings
h. Crank shaft
i. Cam shaft and bearings
j. Water pumps
k. Lube oil pumps
l. Fuel pumps
m. Timing gears
n. Harmonic balancer
o. Governor
p. Governor control
q. Boring main bearing seats
r. Aligning crank shaft and main bearings
s. Aligning main generator and air compressor
t. Setting timing gears
u. Welding, 180 hours
v. Machine work, 200 hours
w. Portable machine, 60 hours

12. *General Running Repairs:* 1,040

a. Inspections
b. I.C.C. requirements
c. Adjusting governor and speeds
d. Lubricating
e. Testing
f. Portable machines, 60 hours

It will be noted in the above schedule that welding and machine tool operation has been entered under items 1, 2, 3, 4, 8, 9, 10, and 11. It may be desirable to set up separate units for these, but in most cases machine experience and welding experience, due to limitations of such work, will have to be acquired along with other experience, except with companies still maintaining steam power. If the latter is true, then separate subdivisions can be set up for machine tool work and welding.

ELECTRICIAN APPRENTICE TRAINING SCHEDULES

Unit Number	Unit	Time, hrs.
1.	*Coach Lighting and Air Condition (basic):*	1,040

a. Coach lighting panel
b. Air condition panel
c. Current regulators
d. Voltage regulators

e. Air condition relays, thermostats and magnet valves
f. Lighting circuits
g. Generators
h. Conduit
i. General wiring
j. Insulation testing

2. *Diesel Maintenance (basic)*: 1,560

a. Testing voltage values
b. Sequence tests
c. Clean, oil and adjust contactors, relays, regulators and interlocks
d. Traction motors
e. Brushes and spring tension
f. Main generators
g. Auxiliary generator, exciter
h. Blower motors
i. Accessory drive motors
j. Magnet valves
k. Thermal and pressure switches
l. Control drums
m. Insulation testing
n. Automatic transition
o. High potential testing
p. Load testing
q. Light circuits
r. Governors and controls

3. *Repair Bench*: 520

a. Magnet valves
b. Pneumatic contactors
c. Pressure switches
d. Relays
e. Brush holders
f. Accessory drive motors
g. Regulators
h. Testing and adjusting

4. *Drawing Room*: 520

a. Reading prints
b. Interpretation of symbols
c. Familiarization with engineering
d. Problems and policies (board work)
e. Free hand lay out
f. Proper use of various meters and testing equipment

5. *Diesel Maintenance (advanced)*: 1,560

a. Testing voltage values
b. Sequence tests
c. Clean, oil and adjust contactors, relays, regulators and interlocks
d. Traction motors
e. Brushes and spring tension
f. Main generators
g. Auxiliary generator, exciter
h. Blower motors
i. Accessory drive motors
j. Magnet valves
k. Thermal and pressure switches
l. Control drums

6. *Inside and Outside Wiring*: 1,040

a. Plant lighting circuits
b. Shop machine motors
c. Line switches
d. Motor control equipment
e. Pole and line work
f. Transformers
g. Flood lights
h. General outside lighting
i. Power circuits

7. *Coach lighting and Air Conditioning (advanced)*: 1,040

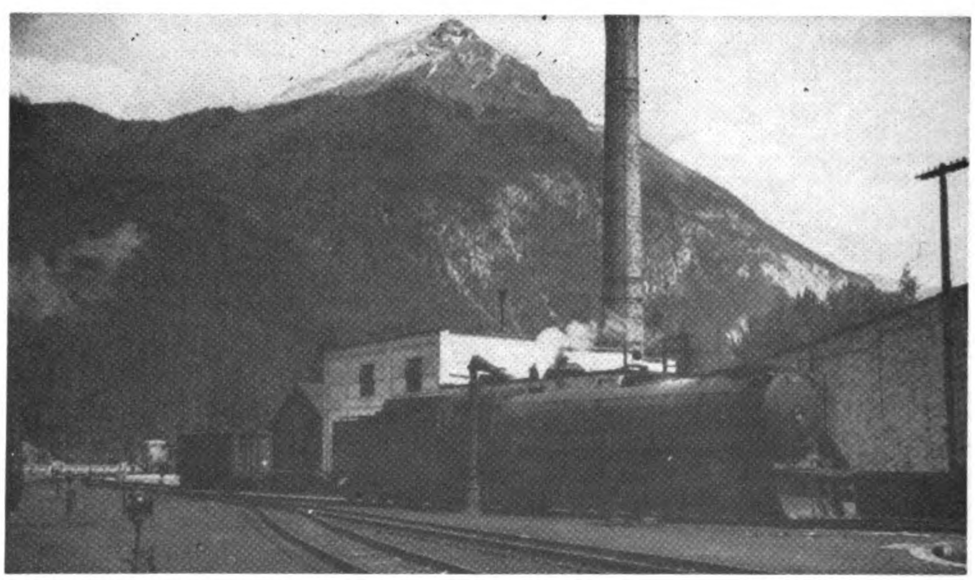
a. Coach lighting panel
b. Air condition panel
c. Current regulators
d. Voltage regulators
e. Air condition relays, thermostats and magnet valves
f. Lighting circuits
g. Generators
h. Conduit
i. General wiring
j. Insulation testing

8. *Storage Batteries*: 1,040

a. Charging
b. Handling
c. Voltage testing by cells
d. Hydrometer and temperature tests
e. Discharging for capacity test
f. Electrolite equalizing
g. Sealing cells

Upon completion of his time, every apprentice should be given a certificate of apprenticeship signed by the proper mechanical officer.

This report was presented by a committeee of which E. V. Myers, superintendent, motive power, St. L.-S.W., was chairman.



Diversified Program at 1952 Air Brake Meeting

K. E. Carey
President
(Assistant road foreman of engines, Long Island)

Besides two addresses, seven reports and a joint session with the traveling engineers, the meeting this year included a symposium on automatic freight car slack adjusters

Just how far reaching have been the effects of dieselization becomes evident when its impact is noted on a department other than that concerned with motive power as such. That the changeover in the means of train propulsion has left its mark on the air brake man and created new problems for him can be seen from the subjects presented at this year's meeting of the Air Brake Association—the 44th since it was founded and the sixth as a member of the Coordinated Railroad Mechanical Associations.

Two of the papers dealt with leakage, an increasingly important subject with the longer trains pulled by diesel locomotives and the higher speeds at which they are pulled. Another paper that resulted from the growing prominence of diesel power was one prepared by a committee on standardization on diesel- and turbo-electric locomotives. This paper covered a wide range of standardization recommendations varying from grouping of air brake hoses to suggestions on the controlled emergency feature and the safety control feature.

Descriptions of equipments, their operation and advantages, were covered in papers on the brake cylinder release valve and on the release control retainer as a means for better braking. Maintenance papers covered the latest approved practices on the D-24 control valve and types B and F relay valves, and the procedures and the facilities for repairing and testing diesel locomotive air compressors.

The association also heard two addresses. One was delivered by G. W. Misner, commercial engineer, Westinghouse Air Brake Company, on the subject To Create by Association a Closer Interest of Air Brake Men. In his paper, Mr. Misner described the advantages of belonging to the Air Brake Association and of attending its meetings, and gave some good advice on how to make the most effective use of such membership and attendance.

The second address of the meeting was by J. W. Hawthorne, general superintendent motive power and equipment, ACL, who spoke on the need for air brake men and other supervisors to become better salesmen and to learn to communicate better their ideas for improvements to their management.

The Air Brake Association also attended the annual joint session with the Railway Fuel and Traveling Engineers to hear a paper on train handling. As in years past, this subject was followed by a lengthy but lively discussion by members of both groups. A symposium on automatic freight car slack adjusters brought the meeting to a close.

The Release Control Retainer As a Means for Better Braking

Slower release of brakes on the head cars of long heavy trains has been found to be advantageous, and has resulted in the slow direct exhaust position of the present standard Release Control Retainer. This provides a somewhat slower brake cylinder rate of release but still allows all brake cylinders to release completely and thus permits running releases without excessive change in slack. It further eliminates the need for manual operation of the retaining valves at intermediate points.

R. F. Thomas
First Vice-Pres.
(General air-brake inspector, C. P. R.)

C. V. Miller
Second Vice-Pres.
(General supervisor air brakes, N.Y.C. & St. L.)

L. Wilcox
Secretary-Treasurer

In the development tests in 1939, a short pipe nipple with a No. 65 drilled hole (.035 in. diameter) was placed in the exhaust port of the retaining valve on a certain number of the cars at the head end of the train. This choke combination, when set with the retainer in normal release position, provided a release from 50-lb. brake cylinder pressure to zero in approximately 135 seconds. Road tests were then run with train lengths up to 125 loaded coal cars exceeding 11,000 tons. The special exhaust fittings mentioned above were applied to the head 25 cars. The A.A.R. brake pipe leakage was from 2 to 3 lb. per minute on the trains tested, and service applications in the form of split reductions were made through a speed range of from 30 to 40 m.p.h. with running releases made at from 18 to 30 m.p.h.

This operation was found to be entirely satisfactory and eliminated the shock, due to the slack action, which was normally encountered. In all cases, the brakes were completely released at speeds of 10 to 20 m.p.h., thus permitting the reapplication of power and not requiring that the trains be stopped. No special brake equipment was required on the locomotive, except it was found necessary to hold from 20 to 30 p.s.i. brake cylinder pressure on the locomotive, in order to prevent undue run out of the locomotive and excessive shock at the head end of the train. It has since been found possible to further reduce the locomotive brake cylinder pressure and still not encounter excessive shocks.

The above tests accomplished several things. It became possible to make running releases where prior to these tests most brake applications initiated at speeds of approximately 25 m.p.h. and under had to be held on until the train came to a stop to prevent rough handling due to run-in and run-out of the slack which in many cases caused break-in-twos. The use of the slow direct blowdown of the car brakes on the head cars also materially reduced run-in and run-out of slack when the signals or road conditions changed so as to require a complete or final stop of the train after attempting a running release.

From the results of these tests, the four-position retaining valve was developed which included the slow direct exhaust position in addition to the standard retaining valve settings. This retaining alve is now called the release control retainer and was adopted in 1941 by the A.A.R. and made standard in 1946. In its present form, the direct exhaust position included a choke and flow passages designed to be equivalent to a No. 60 drilled hole to give a brake cylinder blowdown of 86 seconds from 50 lb. to 10 lb., or 138 seconds from 50 lb. to zero pressure. The release control retainer has been designed to include a separate pipe bracket with the AB valve type of strainer and with the chokes and check valves located ahead of the cock key to provide minimum maintenance. All of the standard retain-valve positions and functions are retained, thus avoiding any change of instruction to trainmen, except those necessary to govern the use of the new position itself.

What Slow Direct Exhaust Can Do

The extent to which the slow direct exhaust position can and is actually being used is not realized by many of us, except for those closely associated with definite braking problems and with the scheduling of long and heavy tonnage freight trains. Three major advantages of the release control retainer, and particularly the slow direct exhaust position, are:

1. The ability to handle long freight trains over much longer territories involving grades which previously required the setting up and turning down of the 10-20 retaining valves at intermediate points.

2. The ability to travel over undulating or medium grades without damaging shock to the train under conditions that require braking for the proper control of the train speed and for the control of slack.

3. The ability to operate over sections of adverse grades and to make running releases at relatively low train speeds without the resultant harsh change of slack, with possible break-in-twos.

Although the use of the slow direct exhaust position has been known to provide large savings in time and money, it is available at a very low cost either through the conversion of the 10-20 retaining valve or preferably through the use of the latest release control retainer, which incorporates improved design features resulting in materially reduced maintenance costs.

Although it is rather difficult to show in dollars and cents the complete savings that have been produced by incorporating the slow direct exhaust position a saving of over 75 minutes in one 80 mile run and approximately 120 minutes in a 140 mile run serve as examples. In both these cases retainers had to be set up at the top of grades, and the train stopped at the bottom of the grades to turn them down.

Considering the second advantage, which makes it possible to handle long trains over rolling grades with materially improved slack control, the road with the 140-mile run when handling 140 to 150 cars of 9,000 tons or more was not able to prevent draft gear troubles at several points with the retainers set in release position. However, when handling these same trains with some 20 to 25 per cent of the head end cars set in the slow direct exhaust position, the harsh run-out of slack was eliminated and the general handling became entirely satisfactory. In fact, running releases at speeds as low as 20 to 25 m.p.h. were possible, which further reduced the running time. Such releases could not be attempted prior to the use of the slow direct exhaust position.

The third advantage, the ability to make running releases at relatively low speeds, is somewhat tied in with the second advantage, although it is a definite separate feature when considered individually. There are many points on railroads where the grades and curvatures are such that under normal conditions it is not practical to do other than make a complete stop, even though the signals change to a more favorable indication. However, when using the slow direct exhaust position, running release can be attempted with practically no noticeable run out of slack and with the elimination of all shock and damage to the lading.

The advantages provided by the latest release control retainer are of help not only to railroads operating over relatively heavy grades and with heavy tonnage trains, but also on railroads where the grades are from zero to .6 per cent, or where train lengths are relatively long and considerable skill is required in the control of the run-in and the run-out of slack under normal conditions due to curves and changing grades.

Not Enough Cars Now Equipped

The operating economies that are possible through the use of the slow direct exhaust position are so great that they just cannot be ignored, but, unless a major portion of the cars is so equipped. the advantages cannot be fully realized. It now requires special attention on the part of those responsible for the setting up of the retainers to insure that a sufficient number of the retainers are set in the slow direct exhaust position for properly handling the slack control for the tonnage being hauled. Many railroads having experienced the advantages of the release control retainer have initiated a conversion program.

Spot checks made of some of the freight cars in Chicago show approximately 50 per cent of these cars equipped with either a converted retaining valve or a release control retainer; at Pittsburgh and at other yards in the East, a similar check shows approximately 65 per cent so equipped. It may be that these relatively low percentage figures have caused many railroads to hesitate in adopting as standard the use of this new position at points where great economies could be realized. Therefore, we trust that this paper, if it does nothing more, has brought to your attention the need for all railroads to follow through on a program of converting the remaining 10-20 retaining valves to include the fourth position, or for applying the latest release control retainer with its improved design features, to all freight cars being handled in interchange.

The report was a presentation of the Manhattan Air Brake Club.

Discussion

Extensive tests of controlled release were run on a 3½ per cent mountain grade. Some 63 per cent of the cars were equipped with slow direct exhaust, and this, coupled with the dynamic brake on the diesel, was more than enough to handle the trains down the grade satisfactorily. One road found that it costs more to convert existing retainers to the four-position type than to buy new ones. On another road, it costs about $4.00 to convert a valve, $9.00 for a new retainer. On this line new retainers are purchased for new AB brakes applied to cars in place of K brakes, but the old retainers are kept. Close attention must be paid to the filter because dirt will spoil proper operation; dirt caused at least one test to be a failure. It was considered discouraging to find so few cars equipped with the four-position retainer when the conversion can be made so cheaply, and how much it improves

operations. Some roads that could use the four-position retainers to great advantage find that there are not enough cars equipped to make it worth while to instruct crews on how to use the new equipment.

Another member reported that his road started in 1947 to turn up 25 per cent of the retainers on the head end of mineral trains in slow direct exhaust and from 15 to 25 open top cars. The procedure has worked well, eliminating numerous stops, rough handling and break-in-twos. This practice cannot be followed on other trains as not enough foreign cars are equipped with the new retainers. In order to set the retainers in slow direct exhaust on 60 per cent of the cars, it is sometimes necessary to go within 10 or 15 cars of the caboose because of the number of cars in the train not equipped with controlled release retainers. It does no harm to jump three or four of cars without the new retainers.

Measurement of System Leakage

There are two convenient times to find system leakage—during charging in make-up yards, or on repair tracks. In yards, inspectors walk trains to correct audible leakage. In practice, many are found in the brake pipe at either the angle cock or hose coupling. Leakage through the hose or through the valve portions themselves are sometimes not found as they are not loud enough to be heard in many repair yards. Where cars are charged by yard facilities and remain until charged, the system leakage indicator can help carmen determine the amount of leakage, reduce the time spent locating leakage, and tell when the work is completed sufficiently to permit satisfactory train operations.

A device (Pc. 94753) exists for checking system leakage on cuts of freight cars being charged in yards; it is essentially a variable orifice located in the air flow passage with a duplex air gage located across the orifice. The orifice is selected to correspond with the number of cars to be charged. The pressure differential across the orifice indicates the air flow required to maintain system leakage after charging. By selecting the right orifice size for the length, a fixed differential indicates tolerable system leakage for that number of cars.

The indicator has an operating handle for by-passing the measuring orifice, and a brake setting position by which brake pipe pressure can be reduced and the brakes set to enable the operator to measure brake pipe leakage. During this operation it would also be possible to determine if all brakes applied and released.

The system leakage indicator has been made to indicate leakage of approximately ¼ cu. ft. of free air per minute per car. Experience has shown that it is not too difficult to obtain such a degree of tightness, and uniformity of system leakage on departing trains is usually obtainable.

Standardizing Rip Track Leakage

Correcting leakage in make-up yards is, of course, necessary; however, cars which pass through repair tracks should need no further attention when placed into trains if proper attention was given to system leakage on the rip track. Standardization of leakage permitted on cars leaving rip track can be achieved only by providing a means of measuring accurately such leakage. An indication of system leakage is possible by simply lapping the single car tester handle and observing the brake pipe pressure drop for a minute. There proved to be some complications to this method since it required that the control valve remain in charging position.

To determine a more accurate and satisfactory way to apply a flow measuring device to the single car tester and to note results obtainable on rip tracks, the principle employed in the system leakage for train charging was considered for the single car test by using Pos. 2 of the test and noting the differential across the charging choke to indicate air flow.

To improve the accuracy and speed of obtaining an indication, a D-24-B feed valve was arranged to provide a constant air pressure in the brake pipe and to vary supply pressure to maintain through the charging orifice in Pos. 2 the amount of air lost through system leakage. The differential recorded across the single car tester while charging in Pos. 2 indicated the amount of system leakage.

After a car had received a portion of its charge of air, the handle could be moved to Pos. 2 and the charge completed in that position. When the supply pressure did not increase to yard pressure, there was no noticeable delay in completing the charge in the indicating position.

The same duplex air gage used on the single car tester was used for measurement of the differential across the orifice in the tester. Tests were made with a series of larger orifices than used in Pos. 2 but it is believed that this orifice size is best.

Determining Permissible Leakage

The amount of leakage tolerable under such a test has never been determined. Car repairmen with more than usual determination reduce the differential of indication to 5 lb. In the summer months during which the test occurred, ¾ of the cars tested met this figure without corrective measures being necessary.

To determine the amount of air passing through the device and out through system leakage per pound of differential, a check was made using orifices as the leakage source. This orifice proved to be smaller than a No. 80 drill hole peened partially shut and calibrated. This calibration showed that approximately 1/16 cu. ft. per minute air flow corresponded to a 1-lb. pressure differential. Measurement of system leakage is best suited to installations where cars are charged prior to testing, as in yards where inspectors handle other repairs.

With the arrangement of the feed valve to the standard single car tester there was found no interference with the standard test with the exception of the release sensitive test. Releasing an application in Pos. 2 of the single car tester permitted the feed valve pressure to increase to approximately supply pressure and provide a higher driving pressure and consequently greater flow through the choke. This condition could be corrected either by providing a by-pass arrangement to return control of the feed valve to the supply side of the tester when making this test, or by rewriting the release sensitive test to accommodate the change in driving head.

The device is, of course, experimental and not entirely suited for regular service on rip tracks. The action of a feed valve such as a D-24-B type provided the indication desired. It was considerably heavier than desirable and its capacity greater than required. During the measurement of small amounts of leakage, it was necessary to have the valve free of supply valve leakage and most of the demand for air was met by the regulating valve alone.

The duplex air gage was required to read identically at feed valve pressures in order to obtain correct differential readings. The differential, however, was developed rapidly when the single car handle was moved from charging to Pos. 2. This observation indicated the possibility that an improvement in the system leakage indicator, Pc. 94753, used in yard charging plants could be made by use of a D-24-B feed valve instead of an M-3 type. With the latter valve it was necessary to allow the device to remain in indicating position several minutes before a stabilized reading could be obtained. By using the D-24-B valve the indicating differential could be obtained quickly once the indicating position was used.

More work is necessary before a practical device can be made available for general use. There are aspects of the standard single car test codes which must be considered. There most certainly is a variation of opinion as to what leakage is allowable for freight cars leaving repair tracks or charging yards. The allowable leakage for the brake system most certainly should be not more than 400 to 500 cu. in. per minute. It would be better to have the value less than that. With the ¼ cu. ft. per minute figure allowed with the system leakage indicator in yard charging plants, a 150-car train would demand from the locomotive 37½ cu. ft. of air per minute to maintain leakage. It is possible to measure this air flow on a per car basis quickly and accurately on repair tracks, using the principle described, with improvement in indication possible by using better differential reading devices.

The report was prepared by the St. Louis Air Brake Club.

Discussion

A member pointed out that charging time is increased appreciably below 20 degrees, and it is a big problem at zero. This was shown by checking the charging time on one individual car at various temperatures between 45 deg. and 15 deg. On another

test both the valves and an AB test rack were moved outdoors and protected from the weather by canvas. At 7 deg. the charging time took from three to five minutes; at 28 deg. the charging time was within the prescribed test limits. This member thought that the slower charging time at low temperatures caused some to think that leakage was occurring, whereas the real trouble was the cold weather.

Air Leakage on the Individual Car

Each repair track, large or small, throughout the country is the one place where the brake system of the individual car should be thoroughly checked for leakage, and with the single exception of replacement of hose coupling gaskets in train yards, all repairs should be made there. The individual freight car is the source of the train brake system leakage. After a freight car has been made up into a train, it is too late; it takes too much time and means unncessary expenditure of money to make the necessary and proper repairs. The time and money spent, due to delays because the air brakes are incorrectly maintained and checked while on the repair tracks, could well be spent to provide proper repair work on the individual car.

In the complete air brake system of a freight car there are more than 51 points of possible leakage, exclusive of the brake cylinder. This means that in a charged train of 150 cars there are more than 7,650 points of possible leakage. In a check of 300 freight cars of all types and ownership, the location of major leaks was recorded, and a graph indicating where they were found is shown in Fig. 1. This graph divides the leakage into two groups —brake pipe leakage and system leakage. The former comprised 70 per cent of the leaks found, the latter 30 per cent.

Brake Pipe Leakage in this case is all leakage that can be detected by the brake pipe leakage test of the A.A.R. Single Car Testing Device Code of Tests. Brake System Leakage is leakage which because of the action of the AB valve when applied will not show up as system pipe leakage, and in many cases will not be detected at all.

Of this system leakage, only 3.6 per cent was found to be from the AB gaskets; the rest was broken crossover pipes to the reservoirs, flange fitting gaskets, broken reservoirs, and other leaks, all in the reservoir system. This does not mean that all leakage found on individual railroad cars will be distributed in a 70-30 per cent ratio, but it does illustrate the fact that 30 per cent of the leakage could go undetected by the single car or brake pipe leakage test. These leaks were found by using soap suds and by making a thorough inspection of the air brake system, no matter what the single car leakage test indicated.

If each and every car had leakage, large and small, distributed in the above proportions, we would be able to detect only 70 per cent of the leakage by the single car test in use today. Let us review the method of making a leakage test and see what it tells us.

The A.A.R. test for brake pipe leakage of a train, as determined during the outbound terminal tests, *or of a single car*, as determined by the single car code of tests, defines brake pipe leakage not in terms of the quantity of air lost to the atmosphere, but in terms (p.s.i. per min.) of the significant result of such loss. The actual c.f.m. of free air leaking from the brake pipe will depend upon the number of cars in the train. If each car should uniformly have an amount of brake pipe leakage which would reduce the brake pipe pressure 3 p.s.i. during the first minute immediately after the 15 p.s.i. reduction has been completed, the leakage from the train brake pipe measured in this manner would be observed to be 3 p.s.i. per minute regardless of train length. In making this test the application has caused the *feed grooves of all the triple valves to be closed* and the loss of air is therefore measured from the *brake pipe itself*, including the branch pipes.

Single Car Test Inadequate

The A.A.R. leakage test does not take into consideration air loss from the auxiliary or the emergency reservoir unless the air loss from the auxiliary reservoir is three times that which exists in the brake pipe. Nor does it check leakage of air from the car system at an operating pressure—a fully charged condition. The leakage test of the A.A.R. single car test device code of tests has become recognized as an inadequate way of measuring the amount of air lost from the air brake system of the individual car, particularly since the advent of AB equipment. When it was first introduced, the standard freight brake was the K equipment which had no auxiliary and emergency reservoir pipes, and in fact had a possible system leakage only from the slide valve of the triple valve and past the mounting gasket.

There are long trains operating on the railroads today that will indicate no more than 3 p.s.i. brake pipe leakage, yet they will have more than 10 p.s.i. taper in the trainline, indicating a much higher amount of leakage than would be expected from 3 p.s.i. per minute brake pipe pressure drop. This is true because leakage is read at a pressure which is 15 p.s.i. below operating or fully charged conditions, and because leakage from the brake pipe only is noted in the cab by the engineman. Leakage to the atmosphere from any place in the air brake system will have its effect on brake pipe taper. If we can control brake pipe taper we can control brake pipe leakage. For this reason a test for leakage of air from the individual freight car brake system should be made in such a manner that all loss of air can be measured with the car in a fully charged condition.

What Leakage Is Tolerable?

The question now arises as to how this can be done simply and with a reasonable degree of accuracy. If the amount of air needed to maintain all leakage from the single car brake system (excluding brake cylinder leakage) can be measured accurately with the car in a fully charged condition, then a condemning limit of leakage can be established, and this limit then used to check brake pipe and system leakage as one.

We must establish a maximum allowable leakage limit which will permit a car to be placed anywhere in a train with other cars which also have the maximum amount of permissible leakage and still maintain a taper which is under 10 p.s.i. (The 10 p.s.i. taper now being assumed as maximum permissible). The problem is this: How much air loss, expressed in c.f.m. of free air, can be allowed when the car is charged to 70 p.s.i. brake pipe pressure (the pressure at which the single car brake system is checked) and still keep within the correct limit at brake pipe pressures which in freight service may be as high as 100 p.s.i. under certain circumstances?

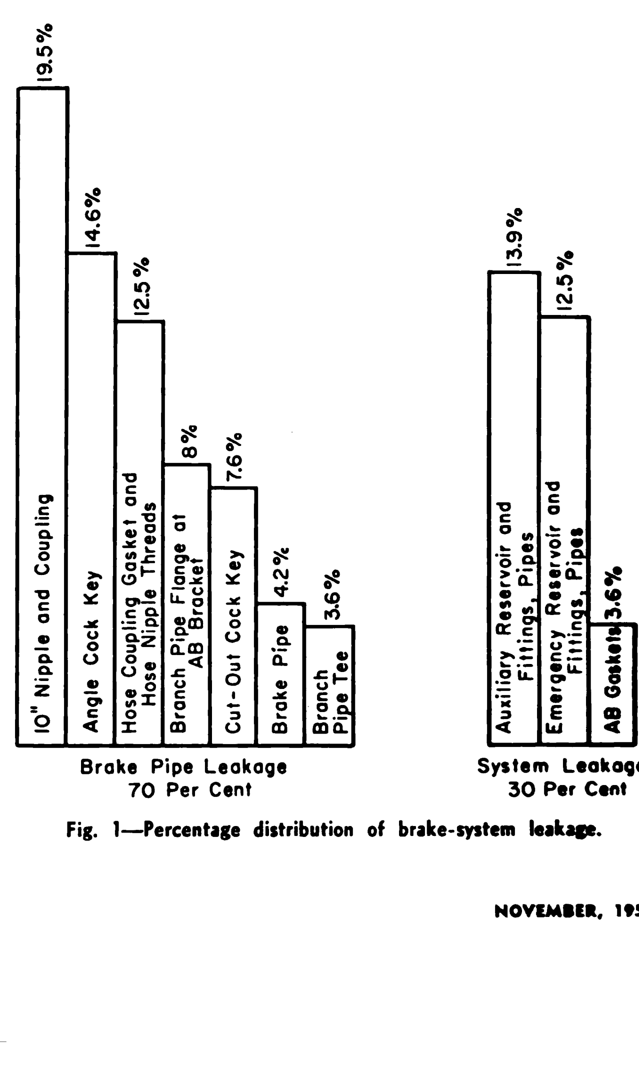


Fig. 1—Percentage distribution of brake-system leakage.

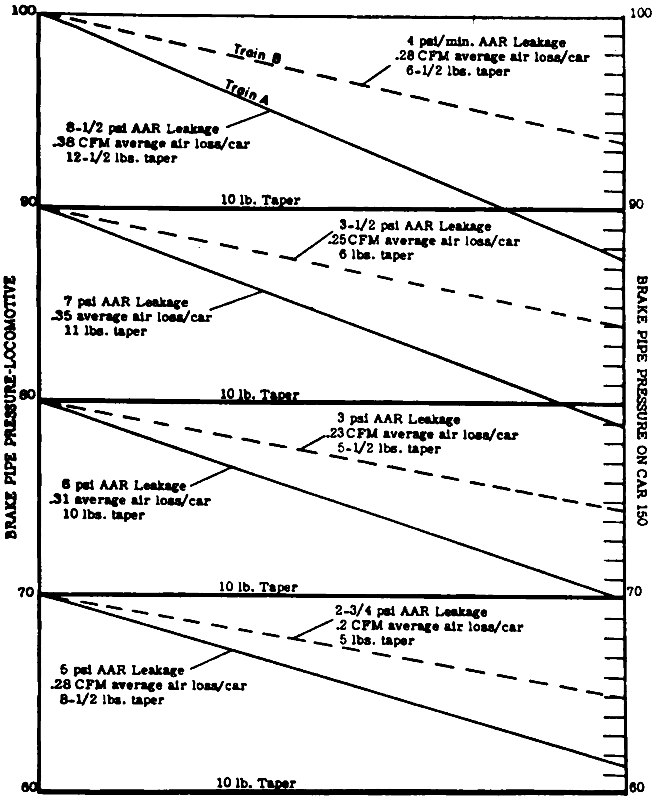


Fig. 2—Two 150-car AB trains with evenly distributed leakage of different amounts.

In Fig. 2 are two trains with two different leakage conditions. Both are 150-car AB trains set up on an indoor test rack for test purposes. Train A (solid lines) had leakage cocks opened in the brake pipe so that the leakage was distributed evenly throughout the train. When checked at 70 p.s.i. brake pipe pressure it was found to have 5 p.s.i. A.A.R. leakage. Train B (dash lines) had 2¾ p.s.i. A.A.R. leakage which was uniformly distributed. Note the average air loss per car for both trains at 70 p.s.i. B.P.; "A" with 0.28 c.f.m. and "B" with 0.20 c.f.m. With all leakage located in the brake pipe, as it was with these trains, it can be seen that 0.08 c.f.m. is the difference in air loss per car which increases the train's brake pipe leakage from 2¾ to 5 p.s.i. The extra 0.08 c.f.m. per car also increases the taper from 5 p.s.i. to 8½ p.s.i. Let us suppose train "B" had 0.08 c.f.m. leakage from the auxiliary reservoir of each and every car, in addition to the 0.20 c.f.m. leakage per car from the brake pipe. Now we would see that the taper of trains A and B would be the same, but their A.A.R. leakage would remain 5 p.s.i. and 2¾ p.s.i. as shown in the graph.

Next, notice the effect on A.A.R. leakage, on average car air loss, and on taper of an increased brake pipe pressure. With a 90 p.s.i. brake pipe pressure, train A now has a taper which is greater than 10 p.s.i. The A.A.R. leakage for this train has increased 2 p.s.i. per minute, and the average air loss per car has increased from 0.28 to 0.35 c.f.m. Train B still has only 3½ p.s.i. per minute leakage and less than 10 p.s.i. taper. At 100 p.s.i. charged brake pipe pressure, train A would have intolerable A.A.R. leakage and taper, but train "B" would have its A.A.R. leakage increased only to 4 p.s.i. and its taper still well within a 10 p.s.i. limit. If train B's cars were to be checked individually at 70 p.s.i. for system leakage, it would be found that the cars at the head end had 0.20 c.f.m. air loss while those at the rear would have a slightly greater amount of leakage, about 0.21 or 0.22 c.f.m. due to the difference in driving head at the points of leakage. This difference is a result of train taper. From this analysis and other data concerning freight train leakage, it seems probable that a very acceptable condemning limit under full charge of 70 p.s.i. for the total leakage from the single car as it leaves the repair track would be 0.22 c.f.m. of free air. This value represents approximately 4 p.s.i. per minute A.A.R. leakage on the single car (some slight variations due to dfferent car lengths). Therefore, if it were all in the brake pipe, the standard single car test would require reduction to 2 p.s.i. or less. Also, this value has sufficient margin of safety to prevent the location of leakage in a train from influencing the taper to an intolerable degree.

The above settles the question of what should be measured and how much air loss should be allowed, but still leaves the most difficult question of what sort of apparatus can be found to measure accurately a leakage of the small order of 0.22 c.f.m. free air when it is being lost from a system charged to 70 p.s.i. When consideration is given to the fact that the air lost can be determined only by a corresponding inflow of air into the car brake system and to the fact that this flow at the condemning limit is only .039 actual c.f.m. in the pipe, it becomes obvious that a suitable flow measuring device must be very superior in its ability to indicate accurately the feeblest of air currents.

Accuracy of Measurement

This may well lead to the question of how we determined the information previously mentioned in this paper in connection with the amount and location of leakage in the individual car. After searching for some time for a suitable and accurate indicator for small rates of flow, we found that a pressure adaptation of the atmospheric flowrator we have used on individual test racks could be worked out well within the limits of flow desired and with an accuracy plus or minus 5 per cent. A test apparatus of even better accuracy was set up for the explorations that have been made thus far. The flowrator consists of a float enclosed in a tapered glass tube which is graduated to indicate the amount of air that is passing through the indicator. The one used to check leakage from the brake system of freight cars was calibrated to read in cubic feet of free air flow per minute at 70 p.s.i. pressure. Of course, steady flow of air is necessary for a quick check, so that any reducing valve that will maintain a

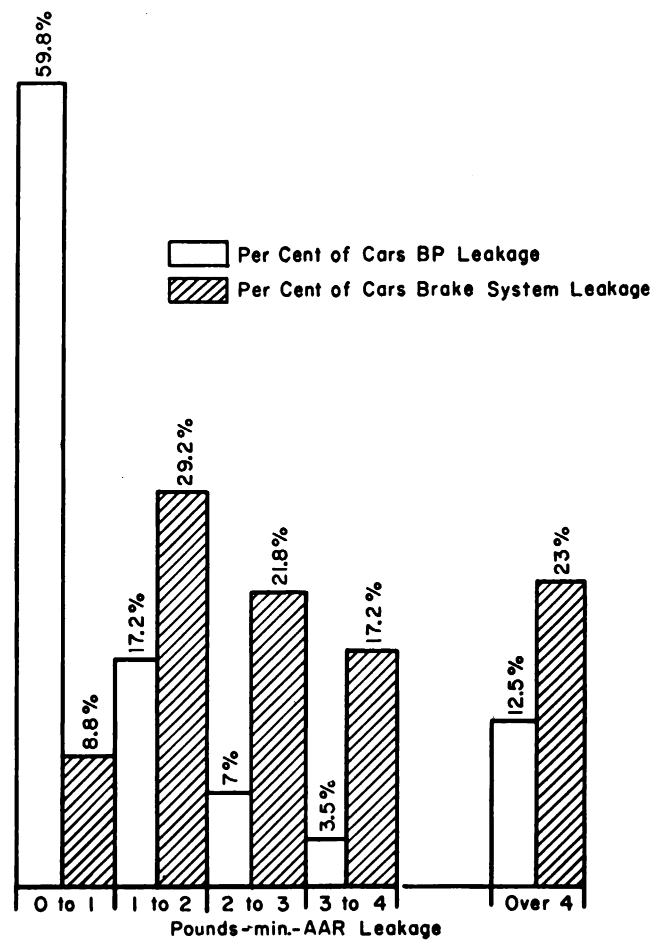


Fig. 3—Comparison between leakages by the A.A.R. test (white bars) and air loss equivalent to those leakages (cross-hatch bars).

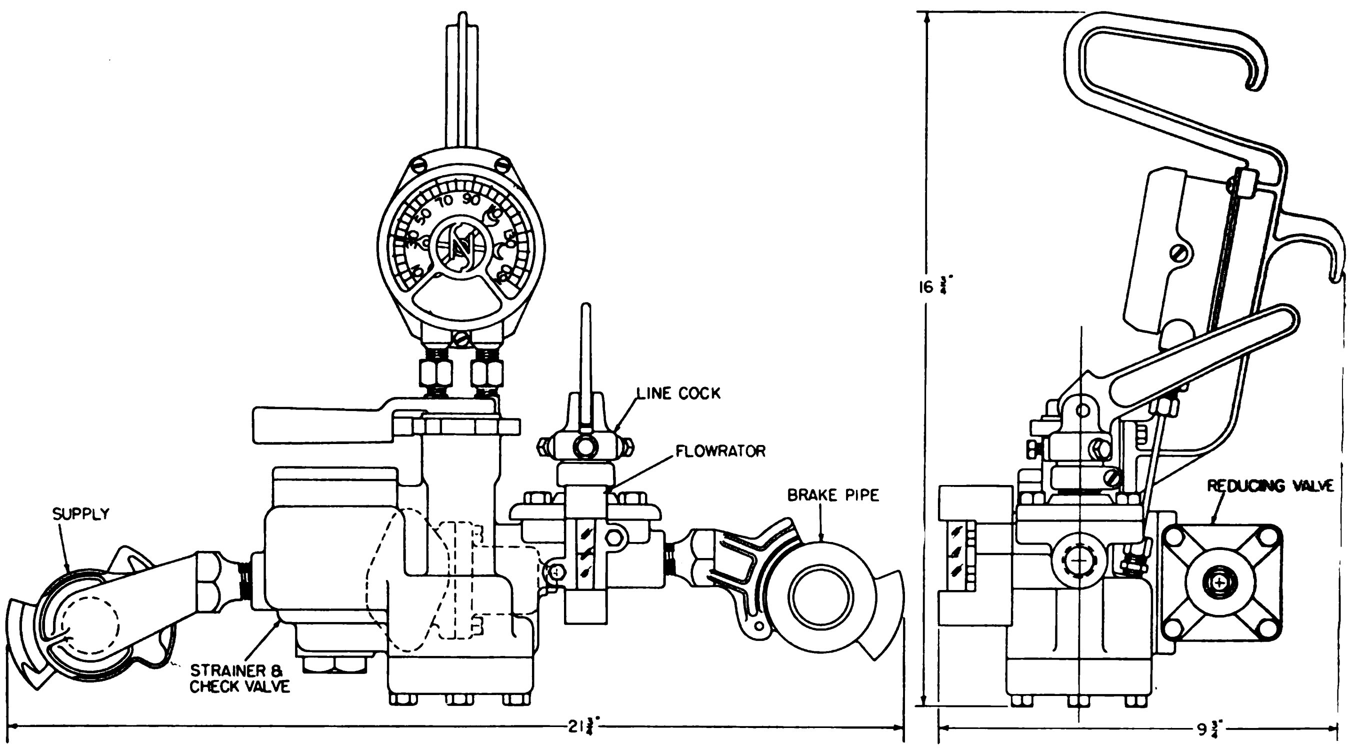


Fig. 4—Single car testing device with a flowrator and special reducing valves incorporated.

constant pressure at a low rate of flow can be used as a supply regulating valve. The flow must remain even and cannot fluctuate in pulses. The amount of flow is in no way affected by the difference in brake pipe volume found in the various types of cars.

Weaknesses of Existing Tests

About 300 cars were checked for leakage this summer, both with the flowrator and with the standard single car tester. Some cars were checked before any work was done to the air brake system, others during and after work. All types of cars from all railroads were tested. In order to establish a uniform length of time for charging, the 15-min. limit was used, though a record of the flow was taken at 10-minutes and 12 minutes after air was applied to the car. After the flow reading had been recorded, an A.A.R. leakage test was made of the car in question and the results compared. Fig. 3 compares A.A.R. Brake Pipe Leakage, as indicated by single car tester, and actual air loss from entire brake system, as indicated by the flowrator, expressed in terms of A.A.R. leakage at 70-lb. brake pipe pressure.

This graph shows a most interesting situation—59.8 per cent of the cars checked, using the A.A.R. leakage test, had leakage that was between 0 and 1 p.s.i. per minute, but actually only 8.8 per cent of the cars had the equivalent of 0 to 1 p.s.i. leakage; 17.2 per cent of the cars had from 1 to 2 p.s.i. A.A.R. leakage, but 29.2 per cent had the equivalent air loss of 1 to 2 p.s.i. leakage. According to the single car test method of checking A.A.R. leakage, 22 per cent were found to be over the 2 p.s.i. maximum. Actually, in terms of the equivalent of air loss, 62 per cent of the cars had more than the equivalent of 2 p.s.i. A.A.R. leakage. This is due to the system leakage that goes undetected by the single car test when the brake pipe leakage test is made.

An example of this, though an extreme case, is not too unusual. A fully charged car, having been on air for 15 minutes, when checked by the system leakage checking device, showed a 0.6 c.f.m. air loss from the brake system. If the 0.6 c.f.m. air loss were all in the brake pipe, it would mean that a pressure drop of around 11 p.s.i. per minute would be indicated. As the situation was, all the leakage was from a broken emergency crossover pipe and the brake pipe was in A-1 condition. The single car leakage test showed this car to have zero brake pipe leakage. It is because of this unchecked system leakage that some trains with low brake pipe leakage will have more than the maximum brake pipe taper.

If 300 or 400 different cars had been checked, the proportion between brake pipe leakage and brake system leakage might have been somewhat different, but it is believed that the group of cars used is representative of summer month conditions. It is our intention to project the investigation into the coming winter months to determine the location and proportion of the system leakage under subzero conditions. The results should make an interesting comparison with Figs. 1 and 3 and settle much of the conflicting speculation on the causes for failure to get long trains properly charged.

Conclusions from the Tests

Investigation of leakage on the individual car has shown:

1. That 70 per cent of the leaks found on cars under summer conditions were located in the brake pipe and its appurtenances. The other 30 per cent were system leaks which are not readily detected and which do not affect brake pipe leakage.

2. That leakage from the individual car system apart from brake pipe leakage has a large effect upon the brake pipe taper in long trains.

3. That a check of the brake pipe leakage alone is not adequate to determine the fitness of a freight car brake system for long-train operation.

4. That a device for use in conjunction with the single car test device for detecting the rate of leakage flow from a single car brake system is entirely practical.

5. That such a device should be calibrated to indicate a condemning rate of 0.22 c.f.m. free air while the car is held charged to 70 p.s.i.

That with this calibration only one car in four will require complete investigation of all pipes and joints for leakage.

Serious thought should be given to the desirability of adopting the flowrator device in conjunction with the single car test device as a part of the repair track operations. To aid the winter investigation some single car test devices have been built which include special flowrators and suitable reducing valves. Fig. 4 shows in outline form the proposed assembly combination. With it a car may be charged on a repair track through the normal 15-min. period prior to running the single car tests; at the end of that time the line cock may be closed to get an immediate indication of the total system leakage of the car. If the float of the flowrator is above the condemning line, the leaks must be located and corrected before proceeding with the single car tests. So long as the float does not indicate excessive leakage, the single car tests may

immediately be started, leaving the final determination of the leakage condition to the standard brake pipe leakage test.

It is our belief that if elaborate investigation of leakage from a brake system on a car is clearly shown to be necessary only in one car out of four, there should result a prompt interest in effecting proper repairs to such car and a marked increase in the overall efficiency of air brake maintenance at repair tracks through more effective assignment of available man-hours.

The report was prepared by M. J. Alger, Jr., Project Engineer, The New York Air Brake Company.

The Brake Cylinder Release Valve

The brake cylinder release valve when used with the AB freight brake equipment provides for a considerable saving in operating time and personnel as well as a saving in the amount of air required for recharging car reservoirs if they have been bled for switching. In evaluating the advantages from the economic standpoint, consideration must be given covering practices in handling cars in various yards, since each yard presents its own operating problems.

Bleeding is the process of releasing the air from car brake cylinders and reservoirs of individual cars in preparation for movement without air. With AB brake equipment it is necessary to pull the release rod and hold it open until air is drained from brake cylinders and auxiliary and emergency reservoirs. With the brake cyinder release valve, the brake cylinder alone is drained. The valve is designed to complete the draining with a manual operation that is only momentary, the operation requiring only one light pull or push on the brake cylinder release rod.

A test was conducted under AAR supervision in 1948 on 21 GN 24-ft. ore cars which developed that 7 minutes and 41 seconds was required to bleed standard AB equipment on these cars whereas, with the brake cylinder release valve, one minute 37 seconds was required to bleed the same cars. This shows approximately 80 per cent time saved by use of the brake cylinder release valve. However in ordinary yard practices the average time used per freight car is nearer 30 to 35 seconds, and the time saving in the bleeding and movement of cars is about 70 per cent.

A common practice in yards is to block open AB valve release rods to avoid waiting for a complete release of the air system. This is undesirable as often the blocking is not removed, causing trouble and delays in recharging and making outgoing brake tests. Further, individuals that persist in blocking often spend more time finding some object with which to block the release valve rod than it ordinarily takes to bleed the car. Since there is no waiting with the brake cylinder release valve, this practice would be discontinued.

The practice in some yards is to bleed cars on the inbound inspection, either by car inspectors, switchmen or additional personnel. With the brake cylinder release valve, services of special or additional personnel could be dispensed with, since it would require only a momentary pull on the release rod and it could be arranged to have inspectors do the bleeding as part of their regular duties. Where inspectors would do the bleeding along with their regular inspections, a saving of approximately 6 hours per 1,000 cars handled, can be assumed. This could be converted either to a saving in personnel or to faster movement in yard operations. In yards where bleeding is not combined with the incoming inspection, time is often critical since switching operations must then wait until bleeding is done.

Advantages During Charging

The major advantages of the brake cylinder release valve shows up in charging outgoing trains as only the air in the brake cylinder is released; the reservoirs retain approximately 60 psi.

It is generally accepted that a time interval of 12, 18, 30, 40 and 60 minutes are required to charge trains of 25, 50, 75, 100 and 125 cars, respectively, to a point where an outgoing air test can be made. Assuming that individual car brake system leakage would reduce the retained reservoir pressure to around 50 per sq. in., a saving of approximately 50 per cent in delay to outgoing trains would be affected.

In yards handling maximum traffic, considering crews, motive power and yard facilities tied up, such as make up tracks not long enough to accommodate full train length, time saved would be important as trains extending out on to switch leads tie up switching operations until train is moved out of yard.

Some yards employ expensive charging plants, which have high maintenance costs and in some climates are unreliable during winter months and cannot be used.

When present AB brake equipment is bled, all the air in 6,000 cu. in. of reservoir volume is exhausted. A yard handling 1,000 cars per day would require approximately 10,000 cu. ft. of free air, not taking leakage into consideration. Thus an appreciable saving in fuel costs and compressor wear could be credited to the use of the brake cylinder release valve.

There are two types of brake cylinder release valves, the QR being the first one to be installed on interchange cars. It was unsatisfactory for interchange cars when retainers were used and happened to be turned up. If it were found necessary to release a car brake, operation of the release valve would release the car brakes but would not reset when the AB service piston moved to release position. This being the case the brake on this particular car could not be set while the retainer was turned up.

The QRR overcomes this undesirable condition, and may be obtained for right or left hand installation or for mounting on a modified AB pipe bracket.

This report was prepared and presented by L. A. Stanton, general air brake supervisor, GN.

Standardization on Diesel and Turbo Locomotives

Due to the different builders using various sized air hose for, in many cases the same use, it is at present necessary for the railroads to carry in stock as many as two dozen different sizes of hose. There is a definite need for a uniform piping arrangement which will utilize a minimum number of standard hose sizes.

In view of this association and the A.A.R. recommending that all locomotives be equipped with either 6 BL, 6 SL, or 24 RL brake equipment, only the hose necessary for the above equipments and the present designs of locomotives were considered.

While piece numbers are listed for armored hose, there are no objections to the use of rubber hose, providing the recommended sizes are maintained.

The committee therefore recommends for transmittal to the A.A.R. brake and brake equipment committee, for further handling with the committee on locomotive construction, the need for a uniform piping arrangement on all locomotive units, regardless of builder, which will utilize a minimum number of standard hose sizes. To assist in this recommendation, a grouping of hose according to use, is given in the table.

Location of Equipment

In the past, the location of operating devices, brake valves, rotair valves, foot pedal, reverser, throttle and air gages were made with too little consideration given to contortions necessary

GROUPING OF HOSES ACCORDING TO USE

Use	Size	Coupling	Piece No. N.Y.A.B.	Piece No. W.A.B.
Main reservoir equalizing pipe end connection	1⅛ in. by 23 in.	L S-4	N-3755	505428
Distributing valve equalizing pipe end connection	⅞ in. by 25 in.	E S-3	N-6872	538402
Signal pipe end connection	⅞ in. by 25 in.	H S-3	N-6055	529856
Signal pipe line connection	⅞ in. by 25 in.	—	N-4971	539684
Underframe to truck, brake cylinder line connection	⅞ in. by 25 in.	—	N-4971	539684
Brake pipe end connection	1⅜ in. by 23 in.	F S-5	N-3751	505247
Brake pipe line connection	1⅜ in. by 22 in.	F S-5	N-7369	539636
Electro-Pneumatic straight air pipe end connection	⅝ in. by 25 in.	E S-2	N-4333	511890
Electro-Pneumatic straight air pipe line connection	⅝ in. by 25 in.	—	N-4028	509960
Independent application and release pipe end connection	⅝ in. by 24 in.	H S-2	N-3754	505427
Actuating pipe end connection	⅝ in. by 24 in.	H S-2	N-3754	505427
Sander operating pipe end connection	⅝ in. by 24 in.	H S-2	N-3754	505427
Pneumatic throttle pipe end connection	⅝ in. by 24 in.	H S-2	N-3754	505427

by enginemen when operating forward or reverse. Space for inspection and adjustment of devices, and visibility afforded enginemen when manipulating devices, was not given too much attention.

Inspection of a considerable number of units clearly indicated that to arrive at a reasonable recommendation, extensive examination of possible cab arrangements would have to be made, taking into account the assorted sizes of men who operate such units and availability of space in cabs already in service. Through the use of mock-ups and with movable equipment, exhaustive studies were made to provide a comfortable cab arrangement with items located for inspection and removal.

Road Switch: Center line of automatic brake valve approximately 39 in. from cab side wall, 16½ in. from center line of controller stand and 8½ in. ahead of center line of enginemen's seat, 40 in. from floor to automatic brake valve handle and at the left of the engineman when facing forward.

Switch Power: Same as road switch with some variation permitted due to cab size and except where age and previous arrangements cannot be economically changed, center line of controller stand approximately 35 in. from front cab wall and 38 in. from side cab wall. The center line of the automatic brake valve should be 17 in. ahead of the controller stand and 15 in. from cab side wall, thus placing the brake valve ahead of the engineman when facing forward, with the handle being about 40 in. from floor.

Road Power: In general location of equipment is fair from an operating standpoint but is subject to improvement for better maintenance. Later models have shown consideration by builders, but the older types can be improved by rotating the brake valve pedestal so as to expose the feed valve for inspection and removal as well as relocating or protecting the rotair valve from damage and making the escutcheon plate visible.

An item of frequent condemnation and confusion is the use of non-standard angle cocks in brake pipe connections. In spite of efforts to educate maintenance and inspection forces, all too frequently inspectors have improperly positioned cocks substituted for angle cocks. Maintenance forces have misapplied such cocks and even taken end cocks apart and changed the handle position to conform to that of a cutout cock.

Consequently it was recommended that:

For road locomotives standard angle cocks be used for all brake pipe connections. Where structural characteristics are such as to preclude the use of an angle cock, a brake pipe end cock may be used having a double locking handle so installed as to be easily visible so that handle position can be readily checked. For switch power the use of angle cocks is preferable. When necessary double locking cut out cocks may be used.

Time and operating experience has indicated that certain features of the 24 RL brake schedule can be eliminated without impairing the general purpose of the brake. A number of roads have eliminated all or at least one of the questionable features from the locomotive brake schedule.

Three Unessential Features

The human element has in a great measure been responsible for accidents involving controlled emergency brake applications on locomotives, in that the rotair valve was improperly positioned. Records indicate that a greater per cent of brake emergencies are not initiated from the locomotive, but instead, from car brakes functioning in undesired emergency during service braking, train separation and by improper handling by the conductor's valve.

We are all familiar with the intended controlled emergency brake cylinder pressure built up on the locomotive but question the wisdom of a delay, greater than the time of full brake cylinder pressure on the car brakes, especially since there is no system of control as to locating loads and empties in the train make up.

Any delay of brake cylinder build up on the locomotive can be controlled by the engineman by proper handling. An emergency application should obtain the quickest brake cylinder pressure build up, automatically, and let the engineman decide upon any delay period and give the proper handling in line with the conditions and as provided by the rules of the management.

The controlled emergency feature when used with dead units in tow is not synchronized to function in brake cylinder pressure timing with car brakes, either freight or passenger. The delay to build up of brake cylinder pressure when a locomotive is moving light or handling a few cars when switching and controlled emergency feature cut in, has resulted in loss of life, personal injury and extensive property damage.

Some railroads have removed the controlled emergency portion from the D-24 control valve and have experienced far less troubles than those who endeavor to change from non-controlled to controlled emergency, when train length exceeds a certain number of cars.

Some lines have pegged the rotair valve for passenger and passenger lap positions only, others have built up the rotair valve quadrant between passenger lap and freight lap positions, so the handle cannot be moved to a position to give controlled emergency, and others have removed the controlled emergency portion from the D-24 control valve, replacing it with a blanking plate. Why clean and maintain a device not used?

The safety control feature has its merits but since it is not universal in its application, becomes a nuisance rather than an asset. Enginemen cut out this feature for various reasons but mainly because of having to hold the foot pedal depressed. Seals are broken on cutout valves and this feature cut out when any unusual conditions of the brake equipment occurs. Some railroads permit of cutting out of the safety control when a locomotive so equipped is used in local service doing switching, then it is never again cut in on the trip.

The confusion comes from not all locomotives used on a district being equipped with safety control, the engineman forgetting and removing his feet from the pedal. The recovery of the brake, resetting the PC switch or even starting the diesel engines that stopped has caused bad train delays. Where two or more employees are in the cab, there is no necessity for such a device.

Railroads who desire the safety control feature as a part of their brake schedule, should remove all means of cutting out this feature and assess a penalty to those responsible for inserting a blind gasket in the piping except under certain emergency instructions. A half-way method of maintaining or supervising those handling this feature of the brake schedule, is far more damaging than removing it from the 24 RL brake equipment. High maintenance and inspection costs to meet requirements, only to have the engineman close a cut out cock in the air line, cutting out this feature, is not profitable. The safety control feature should be removed from the basic locomotive brake schedule.

The overspeed protection feature in its present application has proven uneconomical in maintenance and unreliable in performance. One railroad represented in this committee has less than 25 per cent of its freight and passenger units so equipped. The passenger units so equipped have the speedometer connected to the idling wheels of the truck and gear ratio for 20 per cent above the system maximum allowable speed. Such an application will not function for the purpose intended and does not provide protection from overspeed of the traction motor armature when power driven wheels slip. When the speedometer is connected to a power driven wheel or axle, only that traction motor armature is given overspeed protection; other traction motor armatures get their protection from the wheel slip relays. What protection is given the armatures on booster unit traction motors of a lower gear ratio than the lead unit having overspeed protection feature, when the lower gear ratio speed is exceeded, except with good instructions? If instructions meet requirements in one instance why the overspeed protection feature? The overspeed protection feature in its present application is inadequate and misleading. By proper check of speed tapes by the road foremen and corrective handling, greater benefits will be attained than by relying on a device set to function at a speed far higher than the maximum allowable speed.

Where to Place Equipment

In order to prevent the accumulation of moisture and the possibility of freezing in sub zero weather, control valves, master controllers, relay valves, 21-B magnet valves and other similar pieces of the locomotive brake equipment, when practical, should be located inside the locomotive in a place where they will not be exposed to excessive heat or severe outside temperatures.

The ideal location for this equipment on conventional type pas-

senger and through freight locomotives is along the right engine room wall or in the nose of the unit, thereby eliminating excessive piping. However, they must be so spaced that the removable parts requiring periodic cleaning and testing can be removed without disconnecting pipes or interfering with other equipment.

If the brake equipment must be placed beneath the cab floor, suitable openings in the side wall should be provided to reach these portions, especially if the head clearance between the engine room and cab floors is less than 40 in.

On road and yard switchers, where sufficient inside space is not available, making it necessary to place the control valve, relay valve, etc., outside, it is preferable to locate them on the running board or some other suitable place above the locomotive frame.

Combined reservoirs (auxiliary, emergency and displacement) may be located either inside or underneath the locomotive frame, provided the displacement reservoir head is accessible for changing the diaphragm.

Main reservoirs, in addition to being placed in the coolest spot possible, should be arranged so they may be subjected to hydrostatic pressure without difficulty and the entire surface hammer tested by turning the reservoir in its bracket without removing from the locomotive.

Due to early and continued efforts of builders to keep the dashboard type of cowling with several gages contained therein, air gages were introduced that were of such diameter as to make visibility hard of accomplishment regardless of method of lighting. As it is important that gages indicating air brake pressures be easily visible and susceptible to the least accumulation of dust as is possible, air brake gages for road power should preferably be of 5 in. diameter and not less than 3½ in. For switch power the gages may be 3½ in. in diameter so mounted as to be well lighted and easily cleaned and inspected.

The report was submitted by a committee of which C. E. Miller, N. Y. C., is chairman.

Discussion

There was some disagreement with the part of the paper which advocated removing all means of cutting out the safety control feature. A W. A. B. man said that standardization helped the builder of air brake equipment because it promotes economy of manufacture and it simplifies the stores problem. The diesel builders want standard equipment to which specialties can be added, or subtracted, as requested by individual railroads. He said that the safety control feature was developed with the cooperation of one of the brotherhoods who chose what the time delay should be. He added a word of caution on omitting the controlled emergency feature. This was developed as a result of A.A.R. power brake tests run from 1925 to 1931. If the times have changed to the extent that this feature is no longer desired, it can be left off as the individual railroads may choose. He thought, however, that we should be careful before endorsing such a recommendation.

Reasons advanced by members recommending that the Air Brake Association not go on record as favoring the elimination of controlled emergency were: it reduces slack and shock; it synchronizes the locomotive brake pressure with the train brake pressure; and it can be nullified with the independent brake if so desired. As an example of what it can do one member said a very smooth test stop was made with 100 empty hoppers with controlled emergency and without power. One road that has annulled the controlled emergency feature, however, reports no trouble.

The question was raised as to whether it should continue to be necessary to hammer test main reservoirs as the enamel inside coating is applied to prevent corrosion. A Westinghouse member said that the manufacturer designs the reservoir with adequate metal for strength plus some extra for corrosion, and then enamels it as added protection. A railroad member said his road finds it economical to keep a spare set of reservoirs which are washed with steam and hot water. All failures found were discovered on hammer tests and none on hydrostatic tests. Another member mentioned that reservoirs have to be cleaned to get out the muck and the oil from the air compressor, and therefore have to be removed from the locomotive. Some states are accepting an inspection hole in the reservoir as a substitute for hammer testing, this gives good visual inspection inside as well as outside.

C. E. Miller, the committee chairman, recommended that the paper be adopted as representing the majority of the committee, but not necessarily of the entire association. He favored each railroad looking upon the report as a general basis for its own policy modified as necessary to suit individual circumstances. The recommendation was adopted.

Car Men Are Told To Get Busy and Reduce Hot Boxes

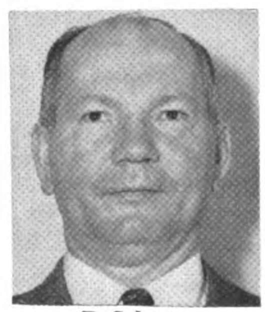
W. N. Messimer, President
(General superintendent equipment, Merchants Dispatch Transportation Corp.)

A. H. Keys, Vice-Pres.
(Superintendent car department, B. & O.)

C.D.O.A. in annual meeting is urged to redouble its efforts in hot box prevention and the more efficient use of cars

THE Car Department Officers' Association held its 12th annual meeting at the Hotel Sherman, Chicago, September 15 to 17, inclusive.

At the opening session, A. E. Wright, president and general manager, Manufacturers Railway and St. Louis Refrigerator Car Company, discussed the subject, Personnel and Personnel Relations and maintained that it does not receive deserved attention on most railroads. He said it is no use to effect marked improvements through technical research and not develop trained men to put these improvements in practical use. Mr. Wright urged that some means be found: (1) to encourage more promising young people to enter railway service; (2) to develop supervisors with real qualities of leadership; (3) to educate, cultivate and stimulate men in the ranks. He said that most men are activated by something besides the dollar sign and it is the definite responsibility of management to create a place where men enjoy working, where a favorable atmosphere is maintained and men can take pride in their work. In closing, Mr. Wright called attention to an expenditure of roughly $7 billion for new capital investment by railroads since V-J day and asked how much they have spent on the human machine in that time.



R. Schey, Vice-Pres.
(General superintendent car department, N. Y. C. & St. L.)

J. F. Likarish, Vice-Pres.
(Master car builder, G. N.)

President Messimer's Remarks

In opening the convention, President W. N. Messimer, Merchants Dispatch Transportation Corporation, said the association is now recognized as a going concern with a present membership of 1,165 individual members, sound if somewhat limited finances and an increasing influence for the improvement of railway car conditions generally.

Committee reports on the first day included Interchange and Billing for Car Repairs, presented by Chairman J. J. Sheehan, supervisor of car repair billing, M. P.; Air Conditioning Equipment, by R. F. Daugherty, general electrical and air-conditioning inspector, U. P.; and A.A.R. Loading Rules, by A. C. Bender, joint supervisor of car inspection, Cleveland Car Inspection Association.

On the second day, the report on Conditioning Cars for Higher Commodity Classification was presented by Chairman T. E. Hart, chief car inspector, Nickel Plate, with prepared discussion by C. A. Naffziger, director, A.A.R. Freight Loss and Damage Prevention Section. The report on Car Lubrication was read by Chairman K. H. Carpenter, superintendent car department, D. L. & W. and discussed including comments by W. M. Keller, director of mechanical research, A.A.R.

E. E. Packard, Vice-Pres.
(District master car repairer, S. P.)

F. H. Stremmel, Sec.-Treas.
(Assistant to secretary, Mech. Div., A. A. R.)

Other committee reports on the last day included Analysis of Train Yard Operations, read by Chairman W. B. Medill, district master car repairer, S. P.; Wheel Shop Practices, by E. W. Kline, general wheel shop foreman, B. & O,; Painting, by Chairman F. M. Vogel, painter foreman, D. & R. G. W.

Report of Committee on Painting

The first and most important consideration in any paint job is to have a clean working surface. This may be obtained by washing, or by sand-blasting. Without a properly prepared surface we cannot expect a good job, and the paint and labor invested will be wasted.

In some cases, new metal panels are installed on old equipment and they must be properly prepared before being painted. This can be done by sand-blasting or by washing with an efficient solvent. After washing, they should be etched with phosphoric acid and the acid should be cleaned off with alcohol and water. For a new surface, or one which has been sand-blasted, a good primer properly applied is an excellent start in heading off rust and corrosion.

The number of undercoats and finish coats to be applied will in large be determined by service requirements and experience.

In the past we have discussed the advantages of both brush and spray lettering, and the use of stencils and masking tape. We will discuss, later, lettering and the effect of car washers on this work. We have found that car washers are hard on putty and glazing compounds and the use of these materials should be kept to a minimum on exterior painting.

Painting Diesel Locomotives

In general, the painting practices used in car painting can be extended to diesel locomotives, except that the light metal used on diesels should be taken into consideration insofar as sand-blasting is involved. We must also consider the effect of sand and dirt getting into electrical equipment of diesels when sand-blasting is used. We believe the best method on diesels is the use of a stripper, which should be washed off, and the surface treated with phosphoric acid. We have had good results using both enamel and lacquer for diesel interiors. The interiors, of course, require thorough cleaning before painting.

Various methods have been presented for the handling of galvanized car roofs, and the question arises as to whether or not they should be painted. Some roads wash with an acid, while others use a primer containing phosphoric acid. This should be necessary on new roofs, but years of experience have shown that after a roof has aged for a few years it becomes oxidized and will hold any good paint.

Before any application of car cement, a good primer coat should be used.

Stencilling Milwaukee Passenger Cars

In lettering and stencilling Milwaukee passenger equipment, the old method was to apply two coats of lettering enamel by hand.

Later, metal stencils with raised wire bridge ties were used, but it was found not practical to spray a sharp edge on account of rivet heads, buttons, etc., causing under stencil fogging. Still later, the move was to ready-cut masked stencils, either hand-cut or machine-cut. An adhesive coating was applied to the letter board that placed these stencils in their proper places and then cut out the ties and sprayed two coats of enamel. This method does a nice sharp-edged job and the paper masked stencil must be removed before the paint is thoroughly dried.

Because of the wear on embossed letters by mechanical washers, the Milwaukee is now applying the lettering and striping material two coats and then masking these before applying finish coats. In this way, the lettering and striping recessed is below the level of the finish coat. This system also has its draw-backs as when cutting out the letters, if the operator uses too much pressure with the knife he may cut through the finish film.

Ten cars have maroon Scotchlite reflective cutout letters applied on them for test. These cars have not been in service long enough to report on the durability of this material.

Cleaning N. Y. C. Air-Conditioning Parts

In cleaning air-conditioning ducts, evaporator and condenser on N.Y.C. passenger cars the various operations are as follows:

(1) Cover all seats and upholstery, using canvas covers. Open zipper of flexible duct or remove flexible duct at end duct opening and evaporator. Lower hinged ducts and check all ventilators to be sure they are in opened position throughout car. Operator to wear hood type respirator for blowing out ducts.

(2) Clean out ducts, using air hose with pipe connection at end of hose to enable operator to extend air into duct at evaporator end of car, using approximately 90 lb. air pressure, keeping air hose in motion across width of duct, allowing approximately 20 min. for this operation. Move air hose to duct openings throughout car, blowing off fins and interior of ducts at each opening. Move air hose to duct opening at evaporator and for the second blowing at this opening, blowing out duct for an additional 15 min. or until no evidence of dust remains in duct.

(3) Clean evaporator. Operator to wear goggles during this operation. Check evaporator drain pan to be sure overflow hole is open. Prepare cleaning solution, using mild alkaline solution 4 oz. per gallon of water, preparing 5 gallons of material, heat to approximately 180 deg. F., spray the evaporator from both sides, using mild alkaline solution, spray gun or equivalent, taking care to blank the opposite side of the evaporator from which the spray is being directed to prevent the solution from getting on other parts of the car. Use the entire 5 gal. of solution, dividing it between both sides and then rinse the evaporator using 5 gal. of clear warm water, using same spray gun.

(4) Cleaning condenser—first blow off, using compressed air. Operator to wear goggles and rubber gloves during this operation. Prepare a cleaning solution of Mineral Acid (Baume 20 deg.), weak acid solution, use 5 oz. of solution per gallon of water, making 5 gallons of material. Heat to approximately 180 deg.

(5) Mineral Acid Solution, use 12 lb. of acid to 5 gal. of water (note, it is dangerous to apply water to acid, always apply acid to water). Using either solution, spray both the condenser from both sides and ends, using spray gun or equivalent. Use the entire 5 gal. of cleaning solution, dividing it over the entire condenser. Rinse, using 5 gal. of warm clear water, using same spray gun. Stones and foreign objects can then be removed from fins, using a piece of sharpened wood or a bent piece of wire.

I. C. Terminal Painting

The terminal painting of passenger cars in the past few years has been due to the heavy demand on shop facilities for repainting streamlined equipment. The shop facilities have, in many cases, become inadequate to take care of the painting of some of the conventional head-end and passenger equipment.

To take care of this situation many railroads have come to the conclusion that some of this equipment be painted at terminal points. In many cases equipment in good mechanical condition with paint in poor condition should be painted so that cars will be available for service without the expense of taking them into shops and out of service for any length of time.

This type of painting should be done with much consideration and reservation. The men selected to do this type of work should be qualified painters, and well supervised. Weather conditions must be observed closely as they play an important part in the appearance and durability of painted equipment; as most of this type of work must be handled out in the open.

The exterior equipment to be painted should be thoroughly cleaned. All blisters and loose paint to be scraped off, rust spots to be sanded out and all bare metal primed before putty is applied to scratches and bruises in the old surface. The entire surface to be painted should be well sanded with fine sand paper. All windows and chrome parts to be masked with either paper or masking composition.

The car is now ready for paint. Care must be taken that proper paint is used. If lacquer is to be used, a coat of surfacer should be sprayed on car before finish coats are applied. If spraying synthetic enamels, the usual light or fog coat is first applied, followed by one, two or three medium coats.

The interior painting of equipment should be handled with a great deal of care. Painting should be done only when necessary. In many cases hallways and end bulk heads are painted far too often, and these are painted without washing or sanding. Many times a good washing would be far better than the application of paint over dirty walls.

Next, the subject of removing paint from perforated ceilings. The preferred method is by the removal of the ceiling panels from the car and then removing the paint from the panels with a suitable solution, remembering that for the most part the metal used in their construction is aluminum.

In some cases, where the removal of the panels is not possible, sand-blasting, using spent sand with proper air pressure and a

well-educated sand-blast operator, has been used for this job, but extreme care must be exercised that panels are not warped and that the sand is completely removed from the entire interior of the car.

Our job is to protect and beautify railroad equipment. We should consider ourselves a branch of the advertising department, for it is our work that catches the public eye and creates a good impression of our individual railroads, as well as the railroad industry as a whole.

The material manufacturers are continually producing better paints. We must be ready to gain experience in the acceptance of these new products, and in new and better methods of application.

The report was signed by Chairman F. W. Vogel, painter foreman, D. & R. G. W., Denver, Col.

Discussion

There was considerable general discussion, mostly about terminal painting, cleaning of air-conditioning ducts and equipment, reflectorized marking and car shopping periods as determined by paint conditions.

Report on Train Yard Operations

Train yard operations so far as they apply to car department activities consist mainly of inspection and conditioning of freight and passenger equipment for movement over the railroads. It is, therefore, essential that employees properly trained and of sufficient knowledge of the operations perform the necessary functions.

The first consideration is proper supervision. A supervisor in charge of train yards should be carefully selected for the work that will come under his jurisdiction and he should be a man who can teach others the proper way to perform duties assigned them. It is more necessary in these modern times that some suitable training schedule be set up on 'Human Relations" for the supervisor. We understand this is in effect on a good many railroads now.

Next, employees such as car inspectors, air brakemen, light repairmen, oilers, car cleaners, classification men, etc., should be schooled as much as possible on the different parts of the operations they are called upon to handle. These people should be familiar with all the rules, pamphlets, circulars pertaining to their work, and the foremen or other supervisors or officials should make occasional checks to see that the rules, etc., are being complied with. In addition, we cannot impress upon all concerned too forcibly the absolute necessity of compliance with safety rules; officers should make surprise checks periodically to see that these rules are being complied with, as safety of employees is the first consideration in Train Yard Operations.

Weatherproof Supply Containers

Proper tools should be furnished and kept in good repair. It is also essential that weatherproof yard supply containers with material be placed in sufficient easily accessible points in the train yard so light or running repairs can be made without delay. Air brake plants of suitable installation should be placed in train yards so air brakes can be tested, repairs made, etc., in advance of leaving time of the train.

Inspection should be made whenever possible on industry tracks, cleaning tracks, freight houses, team tracks, to eliminate bad order cars getting into trains, with resulting delay. Also careful inbound inspection should be made on arrival of trains or transfers to reduce all possible work to be performed on trains after they are made up for outbound movement. Whenever practicable, car inspectors should station themselves on each side of a train arriving at a terminal and a good "rolling" inspection be made to discover dragging equipment, flat wheels, out of round wheels, etc.—defects that are difficult to discover when cars are standing still. Many serious derailments have occurred due to broken truck sides and bolsters; therefore, careful inspection should be made of them for progressive fractures, etc. All running gear is subject to heavy use and constant vibration; therefore, it must be inspected closely. Draft gears, couplers, sills, safety appliances, car doors, etc., are also subject to becoming defective in train and switching operations and must be closely inspected and defects corrected.

Train yard operations also include interchange inspection. Cars interchanged from one road to another must be given a careful inspection and all handling line defects either corrected or properly defect carded and all other provisions outlined in the AAR Rules for interchange of traffic must be observed. In this manner proper responsibility can be placed on the railroad which subjected a car to unfair usage.

Journal Box Inspection

Before trains leave the terminals, a careful inspection and servicing must be given to all journal boxes and contained parts, proper adjustment of packing must be made, and at designated points free oil must be added to the boxes when needed. The procedure to follow differs as to different terminals and instructions in effect on the different roads. However, we urgently recommend that all the provisions of the AAR Lubrication Manual be complied with, as the data contained in this manual is a result of careful study over a long period, and a much better hot box performance will be obtained by employees being made familiar with and required to comply with the instructions contained therein.

After trains are made up, a careful inspection should be made of the air brakes, leakage reduced to the minimum and piston travel adjusted to comply with the rules. Any defective air brakes should be repaired or set out of train. It is desirable to make an inbound inspection as far as possible to avoid delay to outbound trains caused by defective air brakes being repaired, or cars being set out of train. It is also desirable to make a complete air brake test on an outbound train with a yard test plant in advance of the locomotive being placed on train, thereby reducing delay. But, however handled, air brakes should be placed in proper condition before train is allowed to operate over the railroad, thereby reducing accident hazard and helping to make better train handling.

In some large terminals, to expedite oiling of journal boxes, one or more suitable tanks are placed in the ground or above at proper locations, then oil lines running laterally across the track at every 1,000 feet, with a ground box between each track frequently used to make up outbound trains. This provides oil for the oilers without the necessity of crossing through cuts of cars to refill their cans and in addition, this expedites the work of oiling trains and in some cases with less manpower. A better job is also the result, as oilers have a ready supply on hand at all times; therefore, are not tempted to stretch out their oil.

Inbound inspection is the most important, as the most costly delays are those of switching cars out of outbound trains, especially if they carry an originating load. Therefore, we should concentrate on inbound inspection in regular train yard operations, also in hump yards, etc. This in itself is quite a saving in train time and switching operations, to say nothing of unwarranted delays to loads.

After a train leaves an originating terminal and has had proper inspection and servicing there should not be any reason why schedules cannot be met, and it should not be necessary to inspect this train every hundred miles or so. However, "fills" or pick-ups at the small terminals should be thoroughly handled the same as at originating terminals.

Walkie-Talkies for Car Inspectors

Members should explore the idea of Walkie-Talkie radios for car inspectors. These instruments are now being given a test under operating conditions in some large train yards. The instrument is a "Doolittle" Radio Pack set Type PG-Z-12 on 161.67 megacycle frequency weighing approximately 9 lbs. each, and are designed to operate on horizon range but under actual operation account steel cars, etc., in yards, range is now limited to approximately 1½ to 2 miles, but this can be corrected for operations over longer distances by electric relay stations to assist in pack to pack conversation. By use of this device car inspectors can be in constant touch with each other and also with their foreman and yardmaster. This will go a long way toward speeding up train yard operations.

The yardmaster and other operating department supervisors in train yards responsible for the on-time dispatchment of trains too often overlook the responsibilities of the car department em-

ployees who must know that the equipment is in a suitable, satisfactory and safe condition to move over the next division without accident or delay. In their zeal to maintain an on-time performance, especially when trains are made up late, the transportation department may endeavor to have the inspection, lubrication and testing of trains performed more rapidly than actually required to perform the several operations in a complete and satisfactory manner. Obviously the inspectors must be given sufficient time to do their work and if, by pressure from other sources, they are induced to release a train as being properly and completely inspected before it is ready, delays, accidents and improper train performance can be expected. It is incumbent upon the car department supervision that they insist on having sufficient time and opportunity to insure that the workmen under their jurisdiction can do their work properly and in a satisfactory manner and they should resist the pressure from other sources that may deter them from this objective.

The report was signed by Chairman W. B. Medill, master car repairer, Southern Pacific, Sacramento, Cal.

Discussion

Chairman Medill, in opening the discussion, urged members to explore fully the possible advantages of Walkie-Talkies as an aid to car supervisors and inspectors in train yard operation, explaining how much time and walking they save and how they permit cutting a bad-order car out of a train of 100 cars, for example, in possibly 15 minutes. He maintained that since trains normally spend as much time at terminal yards as on the road, there would be ample opportunity for adequate inspection, if the time could be suitably allocated. He said rolling inspections are a partial answer and cutting out intermediate terminals another constructive move.

H. L. Price, mechanical assistant, Santa Fe, emphasized personnel problems in train yards; said open-top loads are still giving trouble on account of improper bracing; suggested that portable two-way radio communication is especially valuable in coach yards as well as freight yards; cited the value of inspection pits for running inspection of freight trains and underneath inspection of passenger cars in coach yards.

P. J. Hogan, New Haven, said the mechanical department should stand on its own feet and hold trains until necessary work is done, as it is better to delay trains in yards than to let them get out on the main line where a failure could tie up the railroad.

John Likarish, G. N., referred especially to the problem of infestation and pointed out how important it is to correct this condition in all cars offered for grain loading. He said the danger of placing contaminated cars for loading and subsequent heavy damage claims is more serious than commonly realized and urged every road to make just a little extra effort by closer inspection and attention to this important detail.

Report on Car Lubrication

During the past several years there has been a noticeable decrease in the car miles per hot box on freight train cars. Furthermore, the performance of the journal box lubrication by the waste packing method is not satisfactory and acceptable to railroad management.

An important issue must be settled before the problem of proper freight car journal lubrication can be progressed any further with any degree of success. That problem is the present A.A.R. recommended car oil, effective January 1, 1951. We seem to be miles apart on this issue. Some say it is no good and the results obtained very disappointing. It appears to be no better than we have had for years, although acknowledged that some additives were added to offset some of the inherent basic faults. Others again feel that the present specified oil is satisfactory and doing a good job.

All cannot be right and, as reported and suggested to this body last year, we believe the issue must be settled by engineers qualified to study and analyze the operation, lubrication, service, engineering, etc., and then write an oil and waste specification based on what is actually required regardless of cost.

Hot boxes cannot be stopped unless we are willing to spend some money, which railway managements will authorize if we can assure them that if given the tools we can control them.

The present specification oil is temporary. It is a step in the right direction and we think the A.A.R. Research Bureau will continue to work to the end that a better oil will be developed.

Your committee does not endeavor to pose as an oil expert, speaking in terms of oil laboratory language, but we believe a car oil is needed which meets the following conditions:

(1) An all-season oil. It is not practical to have seasonal oils, in view of the general interchange of cars to all parts of the country. Oils must maintain full fluid film lubrication and support load at relatively high temperatures. They must not rupture under heavy loads and high ambient temperatures.

(2) An oil that will feed readily through the waste packing and reduce inherent friction between the car journal and packing to a minimum, regardless of outside temperature, and one that will not congeal and cause excessive rolling of packing in low-temperatures.

Equally important is the quality of the journal-box packing waste. We feel that waste furnished by all railroads, etc., must meet the following conditions:

(A) Waste threads, or combination thereof, must be able to feed oil to the journal in excess of that necessary to support full fluid film lubrication.

(B) No artificial fibers that, because of their extreme fineness are readily carried on the journal, should be used.

(C) The degree of machining and uniformity of material is essential. Elimination of short ends and lint is necessary.

(D) Waste must withstand renovation with minimum of loss.

The bearing manufacturer has made some progress in producing a better bearing, but we still have too many hot boxes caused by slipped or loose linings. We should provide close and individual inspection of all bearings purchased. If too many defects are found, the entire lot should be rejected.

We recommend the bearing manufacturer again be required to cast the railroad's or purchaser's initials in all bearings to be used under interchange equipment. We believe this will offer an inducement to the manufacturer to produce a better bearing. It would also produce a better inspection on the part of the railroad.

Rule 66 should authorize the removal or scrapping of journal bearings when found with cracked linings, as cracks allow oil to seep between the bearing back and the babbitt, thus destroying the bond and resulting in additional slipped linings.

A great number of hot boxes are due to heat at end of bearing, caused by collar wear, due to rough axle collars. A survey of bearings removed at repack shows 33% removed for end wear. It appears the inside of the collar must be finished same as the journal.

Total Damages Large

Losses due to broken journals and overheatings are too hight. In last year's report the total damage was reported in round figures as follows: 1948—$1,754,000; 1949—$2,292,062; 1950—$2,701,000; 1951—$4,137,339. None of the aforementioned figures cover damage to lading, personal injuries, nor do they include any failure where damage is under $300. These are I.C.C. Bureau of Transport Economics and Statistics Code 2420, Journals Broken, Overheating.

Last year we called your attention to apparent lack of ability on the part of our train yard supervision to properly educate oilers and inspectors in performing their duties in connection with service treating journal boxes. A survey has disclosed a particularly disturbing situation. This was the fact that a very considerable number of carmen appeared to be incompletely familiar with the details of the proper method of packing a journal box and the proper oil saturation level.

Each car foreman should spend some time each week demonstrating to his car inspectors and oilers, the proper method of packing and servicing journal boxes. This is particularly important in the case of men working on night shifts, since the survey indicated a large percentage of night shift men improperly instructed and displaying indifference to the proper methods of maintenance and inspection.

Periodic instructional reviews, spot on-the-job inspections and, above all, education in the importance of adherence to proper methods and the difficulties attendant upon sloppy work will all contribute to ensuring that attention to maintenance standards, once instilled, is kept up to the mark.

Your committee has attempted to bring out some of the items that can effect a definite improvement in the hot box freight car delay performance, but it also recognizes that there are many other items that contribute to a better performance, which, for lack of time, have not been touched upon in this report.

In view of present operating requirement of freight trains, have we come to the crossroad where we must admit that the means of satisfactory lubrication of the solid bearings by means of waste packed boxes is no longer possible? Is it true that the railroads and their suppliers have spent millions of dollars for development of better and more efficient equipment, motive power and cars, track equipment, yet the hot box is still almost as critical a problem as it was a half century ago?

Hot Box Control?

Many railroad officers maintain, and justifiably so, that they can control the hot box problem by assigning enough men to inspect, maintain and service the journals of all freight cars at all important terminals through which the train passes and, of course, allowing sufficient time for such forces to properly perform the work. But where is one going to expect to get enough men or payroll to do that kind of a job?

There has been a trend by some railroads to equip freight cars with roller bearing assemblies; namely, cars generally assigned to traffic on its own particular line for obvious reasons. There is no question that such applications are beneficial and will improve freight train operation, but to apply such assemblies to all freight cars in the country becomes a costly undertaking. However, there are devices now available that eliminate the use of packing waste or pads in journal boxes. Your committee feels that these devices should be explored and followed up; some might be what we have been looking for all these years.

If we are to basically improve hot box performance, some good hard work is necessary. Car men must first of all understand that the principles of the A.A.R. rules and instructions governing the service treatment and repacking of journal boxes must be complied with as a minimum, and if we conscientiously use these rules as a minimum we are sure results will be satisfactory. We cannot expect a decent operation unless we put forth the required effort.

(The report was presented by Chairman K. H. Carpenter, superintendent, car department, D. L. & W., Scranton, Pa.)

Discussion

W. M. Keller, A.A.R., said plain bearing journals will be in railroad service a long time and the problem of hot box reduction must be approached from every logical angle. He indicated that oil is important and further improvements are pending, but without good mechanical conditions, journals will continue to get hot. He said railroads can spend a lot of money for improved waste and yet still experience trouble on account of waste grabs. With better maintenance through efforts of the C.D.O.A. and more edequate lubricating material standards, as set up by laboratory technicians, he said he hopes 1952 will be the turning point in hot box troubles.

G. R. Anderson, C. & N. W., said speed is "of the essence," since hot boxes are now seriously interfering with freight movement. He referred to favorable experience on the North Western with low-viscosity oil in a hoppr car test which showed 30 deg. F. lower journal operating temperatures. He mentioned hot box trouble on stock cars running out of Omaha which was stopped by applying packing retainers to prevent packing rolling and waste grabs.

Another point stressed by Mr. Anderson was that some delays charged to hot boxes are due to other causes, as for example, brine dripping into refrigerator car journal boxes, or worn lugs causing loose covers. He said the Empire roller-type lubricator has been giving satisfactory service with tight covers and dust guards on C. & N. W. equipment for two or three years. He believes railroads must clear up the question of oil and in the meantime concentrate on service attention to journal boxes in train yards where more time is urgently required to inspect long trains.

R. E. Coughlan, chairman A.A.R. committee and engineer of tests, C. & N. W., said the present oil specification works well on some roads and not on others. He expects an improved oil will be available before too long and will produce desired results provided journal box conditions are properly maintained.

F. B. Rykoskey, B. & O., said that in the last analysis, every failure is a man failure; that humping has a lot to do with hot boxes, also slack as it runs in and out; that heavy loaded coal and ore cars are being run too fast; and the quality of car inspection work must be stepped up to minimize bearing failures.

E. E. Packard, S. P., asked if present requirements of the lubrication manual are being lived up to, as linings are not being hooked in many instances to dectect incipient waste grabs, and this practice, when put in effect in Los Angeles yards, reduced hot boxes 50 per cent.

In this connection, P. J. Hogan, New Haven, said it is essential to use a flash light much of the time when hooking journals to find waste grabs and see bad linings at the back of journal boxes.

S. H. Keys, B. & O., referred to seven hot boxes in a 24-hr. period and said the operating vice-president wanted to know why they had to happen on the seven best trains! He claimed that faster acceleration with diesel power is a factor, also heavy loads which increase unit bearing pressures. Mr. Keys said that Flex-Pak type lubrication (recently changed in name to Ply-Pak) has done a good job in two years' test service on the B. & O. He doesn't know if it is the answer, but stated that test runs have been made up to 15 months without glazing or other difficulty. Empire roller-type lubricators also are promising but need a tight oil seal, according to Mr. Keys, who said the B. & O. has 200 Hennessy lubricators in test service and 25 to 50 per cent of passenger cars equipped with roller bearings which give good results with proper attention. He said, "One thing is sure, we must find some way to stop hot boxes."

Report on A.A.R. Loading Rules

The matter of obtaining full compliance with the provisions of the loading rules presents certain problems that are peculiar to each individual carrier, though in general most of the problems that are experienced by any one carrier are common to all carriers. Thus, in our endeavor to see that shippers comply with provisions of the applicable rules, we are all confronted with the same difficulties.

Violations consist primarily of failure to apply lock nuts or nick the threads on bolts or tie rods, as mentioned as cause of train wreck, omission of, or improper tie band and wire protection on sharp edges of *lading* and car parts, the use of blocking, bracing, bearing pieces, etc., having dimensions less than the specified requirements, the substitution of soft lumber in cases where the rules specify the use of hard wood.

Generally speaking, we find that shippers, if properly approached are very cooperative in complying with the loading rule requirements and in cases involving the loading of a commodity, the securement and blocking of which is not specifically covered by the rules, it is the obligation of the originating carrier to instruct these shippers by a competent car department employee.

One of the most frequent serious violations of rules appears to exist on such commodities as scrap iron, scrap tin plate, metal boring, etc. fully covered by Fig. 84 in Pamphlet MD-1.

Violations mainly consist of failure to apply required side protection or no securement when loaded above sides of cars, and investigation too often develops that such loads are originated by the carriers themselves.

In a recent check made by one of the eastern railroads, it was found that 55 cars were shopped at one terminal for a period of one month to rearrange and adjust scrap metal which had originally been accepted from shippers, loaded in violation of the requirements of Fig. 84, as shown in Pamphlet MD-1.

If we analyze all the conditions that contribute to the disarrangement, shifting and damage of loads, we will find that there are three main contributing causes: (1) failure to comply with the published loading rules; (2) improper car handling in yards and on the road; (3) to a lesser extent, the inadequacy of some of the loading rules. Educating those concerned in the mechanical and operating departments would certainly lessen our difficulties.

Your committee believes shippers should regularly check banding and wire-tying machines to be sure they are in good condition and not worn to the extent of not making a proper seal or tie, as there have been cases of bands slipping in the seals and becoming loose in transit. Shippers should be informed of the

revision of general rule 15, which now requires that: Where high tension bands or wires are attached to stake pockets, they must be machine tensioned, sealed, or twist tied at least 18 in. above stake pocket.

The committee recommends that in Pamphlet MD-2 there be included a list of the various high tension bands, wires, bars and plates as shown in other MD pamphlets, particularly MD-1, which will indicate the strength of the various bands, etc., in case they are used in place of rods or bolts.

Proposed changes in Pamphlet MD-3

Figs. 6, 7 & 8: Recommend that minimum length loaded on one side of any pile be reduced to 10 ft. instead of 12 ft., as now specified.

Reason: It has been brought to the attention of this committee that railroads, principally in the South and Southwest regions, are losing business to the trucks due to Figs. 6, 7, and 8, of pamphlet MD-3 confining outside lumber lengths to 12 ft. minimum.

Fig. 14, Item B: Number of pieces, to read a minimum of 6, each side of load.

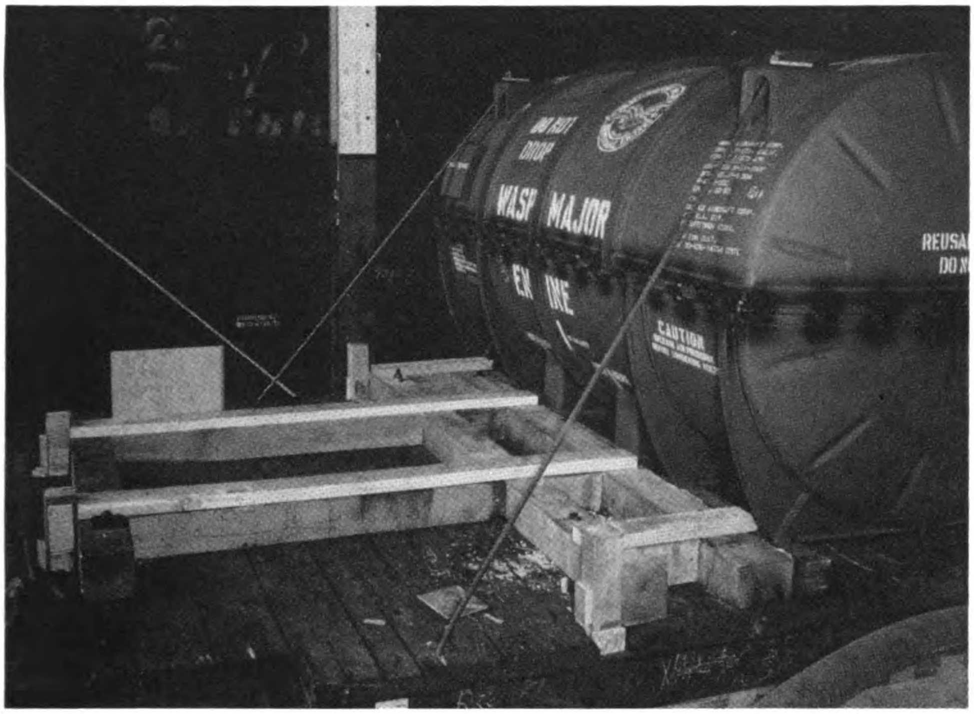
Reason: To reduce space between stakes to prevent spreading, or prevent any portion of load from moving beyond sides of cars, as provided for in Item E.

Fig. 14, Item C: To be applied with butts alternating.

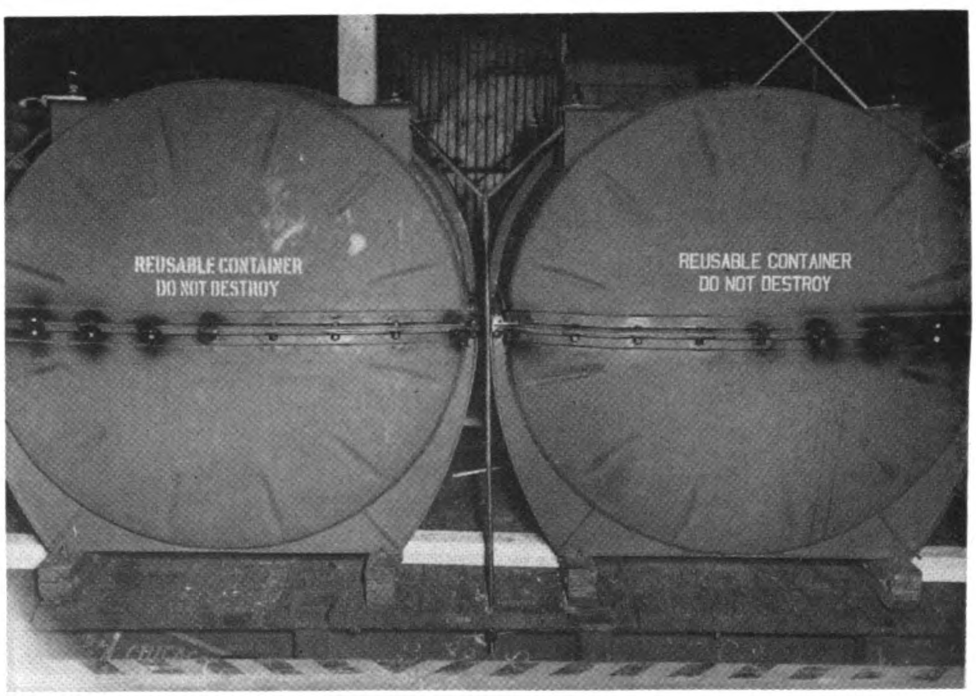
Reason: To prevent loosening of side mesh and obtain a more solid end wall.

Fig. 14: Recommended that heading be reworded to include unpeeled pulpwood by omitting the word, "peeled" therefrom.

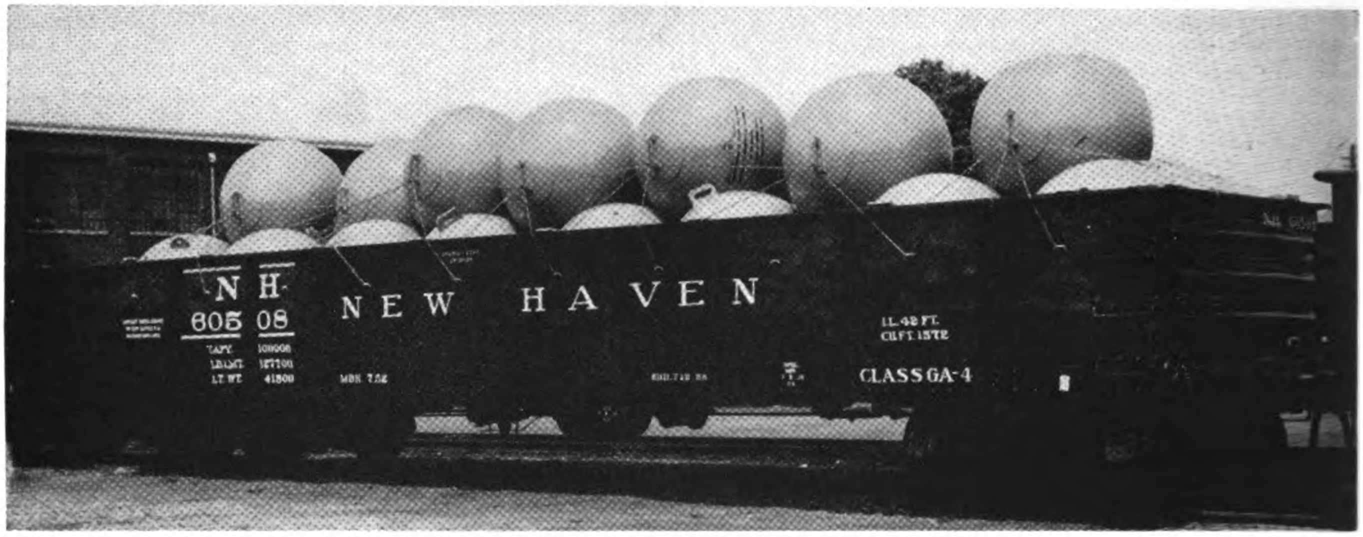
Reason: Due to difficulties being experienced with unpeeled pulpwood and no figure to cover.



Method of loading and blocking airplane engine container on flat car.



Ends of container showing intermediate blocking and the tie rods.



Proposed alternate of loading marine buoys — 25 carloads shipped safely.

Fig. 17: Recommended that new item be included to provide for application of three 2 in .505 HT encircling bands equally spaced insofar as entirely creosoted poles are concerned.

Reason: To provide the additional securement required necessary to prevent longitudinal shifting and reduce stake breakage.

Fig. 18: Recommend same recommendation as for Fig. 17, as this is entirely a creosoted pole load.

Fig. 19: Recommend item G be reworded as follows: 3 per pile 2 in. by .050 in. bands equally spaced between items E.

Reason: Securement as presently provided for, inadequate to provide required protection.

Fig. 24: When item C is required to obtain clearance over idler, then rule should be changed to require similar item C on opposite end.

Reason: To prevent shifting toward non-overhanging end.

MD-4, Fig. 9, Item E: Recommend the wording "with 2 seals each" be eliminated.

Reason: General Rule 15, Sec. B, Par. 8 covers.

MD-5, Page 25: Recommend that sketches covering the arrangement of load on 2 or 3 cars per tables 3 to 35 inclusive, be revised to include a sketch covering a car with a single or double overhang load. This revision also to specify that overhang measurements in all cases be taken from centerline of truck.

Reason: No sketch now shown of a car with an overhang on one or both ends and to conform with General Rule 16, Par. B.

MD-5, Item F. Fig. 44: Specifies the thickness of hot rolled steel and other similar securements to be ascertained by the use of the BW gage. Inasmuch as this BW gage is not generally understood by car inspectors and no car inspectors, to the knowledge of this committee, are furnished this BW gage, we recommend that the item BW gage be entirely deleted from all the figures in the Loading Rules and in lieu thereof the thickness of the metal be shown in fractions of inches, except in cases where use of tie bands are permissible, thickness of same to be shown in decimal of inches. We alsoo recommend that consideration be given to substitute Wrot steel strapping, high tension steel bands, etc., for hot rolled steel, etc., of equivalent load strength.

MD-6, Fig. 54: Recommend revision to place a limitation on portion of tires that may extend beyond car floor.

Reason: To insure adequate bearing on car floor and thus provide safer load.

MD-6, Fig. 3: Recommend that the loading of four and six-wheel motor graders (with pneumatic tires) lengthwise on flat cars, be revised to include tie down securements.

Reason: Figs. 24, 25, 29 and 30, of MD-6, now provide for tie downs to similar motor graders and Fig. 3 should have similar tie downs as a matter of additional protection.

It has been brought to the attention of this committee that the New Haven has experienced some difficulty with a manufacturer of marine buoys to load this product strictly in accordance with Fig. P, Special Supplement #2, and especially is taking exception to applying the cradles and otoher intermediate blocking. This manufacturer in conjunction with the New Haven has developed a method of securing this lading without the use of said cradles and intermediate blocking, as per following photo furnished the railroad. As of date, in excess of 25 car loads have been shipped loaded, as per method illustrated, without any known difficulty. As a matter of additional information, the US Navy, who are consignees, are in favor. In view of this information, your committee feels that consideration should be given to adopting this method of securement as an alternate method to Fig. P of Special Supplement 2.

Airplane engines, including jet engines, in containers: Due to increase in shipping airplane engines in containers on open top cars, this committee feels that there is an urgent need for immediate developments of specifications to govern loading and securements, as illustrated, and recommend the AAR Loading Rules Committee give this prompt consideration.

(The report was presented by Chairman A. C. Bender joint supervisor of car inspection, Cleveland Car Inspection Association.)

Discussion

L. T. Donovan, A.A.R., told the members about an educational program initiated late in 1950 whereby representatives of the A.A.R. conducted, under sponsorship of U. S. Department of Defense, Joint seminars on "Loading and Bracing Methods" for military and civilian personnel of the army, navy and air force at six centrally-located points throughout the country. Visual aids used in this work, which received the personal commendation of General George C. Marshall, then secretary of defense, were shown in the form of color slides by three representatives of the A.A.R.: E. J. League, Bureau of Explosives; Burton Williams, Freight Loading and Container Bureau; and J. H. Campbell, Mechanical Division. The concensus of these men was that visual aids should be utilized to the fullest possible extent in an organized effort to give both shippers and car inspectors a better understanding of the best modern loading methods for all types of commodities.

(The report was accepted and recommendations ordered referred to the A.A.R. for approval before becoming effective.—Editor.)

Report on Air-Conditioning Equipment

As any passenger car air-conditioning system depends on electric power, it is necessary that the power supply be given proper maintenance attention. A thorough understanding of the entire car electrical and air conditioning system is important to obtain satisfactory operation resulting in a minimum of air conditioning and electrical equipment failures, to insure maximum comfort to passengers.

It is the purpose of this presentation to survey the basic maintenance problems of the car electrical system.

The source of electric power is the generator, which may be driven from the axle by belts, gears, a combination of both, or directly from an engine. The power supplied by the generator usually charges a battery and furnishes necessary electrical power to the balance of the electrical system and is controlled by various types of regulating equipment.

The committee realizes that any part of the car electrical system would develop into a lengthy report. They are of the opinion that a series of slides with sound recording will offer a much more interesting presentation; therefore, the various subjects, such as the drive equipment, generators and generator regulators, will be presented in this manner. There are several types and makes of drive and generator equipment, and it is not the intent of the committee to recommend any make or type of power supply system.

The Safety Car Heating and Lighting Company has offered the use of their facilities covering maintenance of Spicer gear drive and generator equipment. (At the request of the committee chairman, H. S. Clark, Safety Car Heating and Lighting Company, presented two instructive color films depicting approved practices in maintaining Spicer drives, Safety generators and generator regulators.)

(The report was submitted by Chairman R. F. Daugherty, general electrical and air-conditioning inspector, Union Pacific, Omaha, Neb.)

Discussion

One member asked about oil leaks at the quill seat of Spicer drives, and it was explained that the quill felt is a dust shield to keep out dust and water, rather than an oil seal. Mr. Lewis said that lubricant is used for cooling as well as to lubricate Spicer drives and that improvements in the present construction give four times the mileage of early designs.

In response to questions, Chairman Daugherty said that this type of mechanical drive to generators is not likely to cause vibration in car floors because the gear drive is rubber mounted on the axle, but held to the close tolerance of .020 in. concentricity. Periodic visual inspection of the drive, torque arm and lubricant are made on the U. P. and the clutch is removed once a year.

Interchange and Billing for Car Repairs

During the past year your committee has considered proposed revision of the present Code of A.A.R. Interchange Rules, and submits the following recommendations for approval and subsequent submission to the A.A.R.*:

Rule 2, Par 2, Sec (b)

Proposed Form: Cars containing flammable or other liquid classified as dangerous which are leaking must be repaired or transferred, without any unnecessary movement or at nearest available point. *Where privately owned cars loaded with hazardous materials are leaking or wrecked, it may be desirable to promptly contact the car owner (or shipper) to obtain information as to proper and safe procedure.*

Reason: Such action is now taken in many instances, and if generally followed could aid in avoiding personal injury and property damage.

* The committee's comments about Rules 9, 23, 95, 101 and 108 are omitted from this abstract of the report for the most part on account of being covered in Supplement 1 or simply requesting rule clarification. None of the changes suggested are effective until approved by the A.A.R.

Rule No. 10

Proposed Form: In noting the cause of removal of wheels and axles, the terms shown in Rules 68 to 86, inclusive, *or* A.A.R. Recommended Practice symbols for marking defective wheels, shown on pages 173, 174, and 175, *shall be used.* These symbols *or the the terms shown in Rules 68 to 86* may be used on the Billing Repair Cards. However, omission of *one or the other of these,* either symbols *or terms,* from the billing records will not justify exceptions to charges.

Reason: To reduce and simplify billing repair cards.

Rule No. 17

Proposed Form: Note 9.—Former A.A.R. Standard No. 15, beams are permissible substitutes for hangerless type beams A.A.R. No. 3 or A.A.R Standard No 18 hanger type brake providing truck sides have brake hanger brackets cast integral therewith, except when the hangerless type beam removed is A.A.R. Standard No. 18, the hanger type beam substituted must be A.A.R. Standard No. 18. However, in cases of handling line responsibility *where former A.A.R. Standard 15 or A.A.R. No 3 brake beams are applied,* defect card should be issued for labor and material

Reason: To clarify the intent that provision with respect to issuance of defect card does not apply where hanger type beam is A.A.R. Standard No. 18.

Proposed Form: (q) Axles: A.A.R. Standard or A.A.R. Alternate Standard tubular type, of same capacity, may be substituted for each other as correct repairs, charges and credits to be on basis of material applied and removed *versus car owner regardless of responsibility for repairs.*

Reason: To clairfy the intent that car owner should be charged for difference in value where tubular axle is applied in place of solid type, or receive credit where solid type is applied in place of tubular axle, regardless of responsibility for repairs.

Rule No. 23.

Proposed Form: Add to Sec. B.—Running boards, metal—welding of cracks of fractures permitted.

Reason: Metal running boards are being scrapped when found with small fractures and as this is not economical and as welding of fractures has been determined as being satisfactory, rule should permit welding of metal running boards. See DV-1179 which was approved by letter ballot but as yet Rule 23 has not been changed.

Rule No. 44

Proposed Form: Sec. (1) All-steel underframe cars having two or more longitudinal sills: when center sills are abruptly bent in excess of 2½ in. *(1½ in. for center sills of A.A.R. Standard Z-Section construction)*, vertically or horizontally, within a space of 6 feet between inside edges of body bolsters.

Reason: Unquestionably, there has been a decided increase recently (within the last several years) in the rough handling of car equipment. This increase in rough handling manifests itself, principally, in a considerable increase in the number of cars admittedly damaged in unfair usage, including Rule 44 cases.

Appearing among the bent center sill cases are comparatively new cars having the stronger A.A.R. Standard Z-Section center sill construction. Due to their stronger construction it obviously follows that such cars will stand a much greater blow in impact than the others and, therefore, as a matter of equity, this fact should be taken into consideration and the suggested addition to the rule be adopted, in order to provide a greater measure of protection for those cars.

Rule No. 60

Proposed Form: (Note on page 137) Stencil on either side or either end of the reservoir presenting clearest view from outside of car *or on hopper car on sub-side sill near release rod.*

Reason: Where construction of car will permit, stenciling located on sub-side sill remains legible a considerably longer time than when located on reservoir. Many roads are now doing this, but strict compliance with Sec. (f) does not permit stenciling in this location.

Rule No. 60-A

Proposed Form: When car is on repair track for any purpose and the stencilled air brake markings show same "In date" the air brake mechanism must be tested as required by the standard instructions for maintenance of brake and train signal equipment, rules 101-102, including code of tests as prescribed in air brake instruction pamphlet No. 5039.4 Sup. No. 1 dated 1-1950, for which charge will be permitted as per rule 111, item No.——.

Purpose for which car was shopped must be shown on billing repair card. The hand brake mechanism must also be inspected, tested and lubricated as required by the standard instructions for maintenance of brake and train signal rule 103.

Reason: To encourage compliance with the above rules.

Rule No. 66

Proposed Form: 7. When wheels and axles are changed.

Reason: It is the intent of the rules and the Lubrication Manual that secondhand or used brass be not returned or applied to any journal other than that from which it was removed.

Rule No. 82

Proposed Form: (Omit note after Par. (1): the remount gage must not be used in connection with reclaimed one-wear wrought steel wheels marked "1-WT."

Reason: To permit condemnation of 1-W Steel Wheels under all conditions.

Rule No. 91

Proposed Form: (8) Q.—What is to be considered "date bill is passed for payment," per sections (b) and (c), on bills paid by draft under A.A.R. Disbursement Rule 23?

A.—Date draft is drawn as stamped on bills.

Reason: To clarify. Some roads claim date such bills are passed for payment is date draft is drawn in payment thereof, others claim that this means date voucher is issued to cover which in some cases may be two or more months after date of draft.

Rule No 107

Proposed Form: Item 56, Note—This charge is not permissible on empty refrigerator cars equipped with hinged type doors.

Reason: Provisions of this Note apply when such doors are replaced per Item 57 and should also apply when hinged type refrigerator car doors are R&R as securement basis covers.

Proposed Form: Items 195, 196, 197, 198. (*No change—add note to apply to each item.*) Note—*When authorized by car owner—see Rule 16.*

Reason: To comply with provisions of Rule 16 and to avoid possible personal injury or property damage which can result from improper procedures with cars handling hazardous materials.

Rule No. 108

Proposed Form: Eliminate Item (a) (4) Brakes, tested and adjusted.

Reason: Account proposed changes in new Rule 60-A and Rule 111.

Rule No. 111

Proposed Form: Item 5. Cylinder-release springs, cylinder piston and rod or cylinder non-pressure head, any or all, R. & R. or R., when not in connection with Items 13 and 14. (*15 and 15-A eliminated.)*

Reason: It would appear that reference to Item 15 and 15-A could be eliminated from above rule, as these two items only refer to AB type work and is covered in Item 21 of the same Rule.

Proposed Form: Establish price for making "In date" test of air brakes, including testing of hand brakes.

Reason: Cost of doing this work on present types of brakes justifies charge for same.

Rule No. 120

Proposed Form: Sec. C, Repair limits for labor on car body should be increased.

Reason: It is obvious that the repair limits specified for labor allowances shown on page 271, Rule 120, should be increased due to recent increases in labor. It has been some time since these allowances have been revised; therefore, it is recommended they be increased to compensate for labor increases.

At the present in making repairs, especially to 50 foot flat car floors, the specified allowance is very often exceeded, and when repair cards are checked by the owner, it becomes necessary to furnish C. B. A.

Rule 120—Par. E

Proposed Form: Last paragraph. In the latter case the owne shall pay $60.00 for the cost of loading and ***shall assume all freight charges***; also, the cost of unloading.

Reason: Under the present Rule *handling line* has to assume transportation charges over its line. Rule 120 cars are generally worn out cars—owners defects. If the owner desires the car sent home loaded on another car, instead of authorizing dismantling, the owner should assume all transportation charges, as he derives benefit from usable second-hand material recovered from car.

P. C. Rule No. 7.

Proposed Form: Par. (e) (1) The wording "Axles standard to car must be maintained," should be deleted from this rule thereby allowing repairing line to charge for applying on A.A.R. standard axle. There are cars having axles with 5½ x 11 inch journals in interchange service and by above wording, owner gets full protection for a Non-AAR axle; something that is not done in any other AAR rules.

Proposed Form: Sec (e) Par. 4, In the substitution of wheels and axles equipped with A.A.R. friction bearing units for wheels and axles equipped with roller bearing units, the principal outlined in Interpretation M-11, Rule 17, Freight Car Code of Rules will govern.

Reason: To clarify the intent and to harmonize with Freight Code.

P. C. Rule No. 22.

Proposed Form: Note 2, Par 2, Non-AAR axles having 5½ in. by 11 in. journals shall be charged and credited on basis of *scrap value* per Item 199 of Freight Rule 101.

Reason: It is unfair to make repairing line allow a credit for a non-AAR axle with 5½ in. by 11 in. journal on basis of an A.A.R. axle with 6 in. by 11 in. journal.

In its report this year the committee gave first consideration to those recommended changes which would effect a further clarification and simplification of the rules, with the thought in mind of eliminating, where practical, unnecessary detail in preparation of billing repair cards and records in train yards and repair tracks. It would be helpful to future Committees, if more men in the ranks would submit their recommendations and ideas, and with this thought in mind, this Committee recommends that the Question Box be reinstated, as it is felt there are many questions confronting members which never get to the A.A.R. Arbitration Committee for a ruling and such a service by this Association would be of great benefit to the membership.

(The report was presented by Chairman J. J. Sheehan, supervisor or car repair billing, Missouri Pacific.)

Discussion

Objections were raised to proposed changes in Rule 60-A, but on a voice vote the committee was sustained. With reference to P. C. Rule 7, Harry Belond, C. M. St. P. & P., supported the committee's recommendation and asked how a railroad can be rightly penalized for substituting an A.A.R. for a non-A.A.R. axle.

(The report was accepted with recommendations to be formally considered and approved by the A.A.R. before becoming effective.—Editor)

Conditioning Cars for Higher Commodity Classification

A freight car, if it is to carry its load to destination without delay, should be selected, before being placed for loading, by competent inspectors who have a general or thorough knowledge of the type of load which the car is to carry. Cars selected to carry flour, grain, sugar and similar commodities, must have good ends, sides, doors and roofs, to prevent rain, snow or cinders entering the car. Interior of car should be in good condition for the commodity intended to prevent loss or damage to contents.

The time for the preparation of freight cars to meet present day operation is while the car is in the shop or on the repair track. A car that is properly repaired before it is turned out of

the shop should give continuous service, without the necessity of placing it on light repair tracks, until it is due for periodical repacking of the journal boxes or the cleaning of the air brakes. Where it is found necessary to continually bad order a car, progressing it from repair track to repair track, as is too often the case, the trouble can usually be attributed to the failure of each repair track to find and correct the defect or repair all existing defects on the car before releasing it for further service. It is the recommendation of your Committee that closer supervision be given to the work that is being done in our shops and on our repair tracks to improve the condition of freight car equipment, which will greatly reduce the delays on the line of road and keep in service a larger number of freight cars to meet the demands made upon the carriers for sufficient equipment to meet present day operation. Many railroads have adopted programs of improving their freight car equipment when it is in the shop for repairs, which has greatly aided in eliminating delays in transit due to again bad ordering the car for repairs.

When a car is shopped for repairs, all of the work necessary to keep it in service for the highest commodity practical should be performed in the proper manner. Periodical cleaning of the air brakes and repacking of the journal boxes is an important function of the repair forces, to eliminate bad ordering the car after it is loaded, or setting it out of a train enroute due to mechanical failures.

Many delays and accidents have occurred, and are continuing to occur, due to lead, copper bars, steel products and similar commodities breaking through box car floors, which is brought about by concentration of weight on single floor boards or over small areas of the car floor permitting the lading to fall through and onto the right-of-way. This condition is not always brought about by defective equipment, but rather is due to the type of equipment which is selected for this specific type of loading. Only cars having sufficient floor supports, or cars equipped with flooring of sufficient strength should be selected at originating points for loading these materials.

Damage to Box Car Floors

Some damage to box car floors has occurred through failure of shippers or consignee to properly comply with the General Rules covering loading of carload shipments of commodities in closed cars. Circular No. 42-B, effective Sept. 1, 1947, states that the "General Rules" MUST be observed for all closed car loading. General Rule No. 5 (D) specifies that "When lift trucks are used for loading and unloading, suitable steel plates must be placed in car to prevent damage to car floors." The Shipper or Consignee who fails to do this may damage car floors and thus may make them unsuitable for a high class commodity. The cooperation of all concerned should be requested where there is known violations of this kind to prevent a recurrence.

Facilities for cleaning cars should be provided at sufficient designated locations on all railroads to properly care for their requirements and so located to avoid unnecessary movement of cars from one station or terminal to the cleaning track and again be back hauled to the station where cars are to be loaded. In constructing car washing facilities, a good practice is to elevate one rail higher than the other, which will tilt car enough to allow the water to properly drain.

In the removal of small oil or grease spots from car floors, many methods are used, one of which is removing the oil spots with an oxygen-acetylene torch, thoroughly scraping same and brushing out car, when the contamination is not too deep on car floor. Another is the use of floor sealers to cover such spots.

The cleaning of cars for grain and grain products is very important in the control of insect infestation and methods which will remove grain or grain products from car, such as blowing out with compressed air at ninety pounds pressure, or the use of live steam or water are recommended.

Whenever steel sheathed-wood lined box cars are given general repairs or whenever it is necessary to renew the top side lining boards or the corner end lining boards for any reason, application of removable lining boards for cleaning purposes, should be provided for, as shown on Sheet C-62-1947 of AAR Manual of Standard and Recommended Practice.

Also, when box cars are given general repairs to prevent retention of grain in pockets behind side lining, grain release should be provided for as outlined on Sheet L-30-1923 of the AAR Manual of Standard and Recommended Practice.

Contamination of Cars

For many years, the improper use of and damage to the better classes of freight car equipment caused by the loading and transportation of contaminating commodities has reached such a volume that cooperative effort among railroads, and between railroads and shippers is necessary, not only to avoid excessive costs of reconditioning equipment for the original service for which it was intended, but also to avoid depletion of equipment available for high-class loading, as well as damage to various commodities loaded in contaminated cars. Much of this can be avoided by employing regularly assigned cars for Hide Service or Contaminated Products as well as reconditioning of misused cars by cleaning or repairs. With the advent of Rule 32 (12) (a) making the road who furnished the car for such loading responsible for Contamination Damage, there has been some decrease in the number of cars being contaminated and this should be checked closely by the Car Department as well as by the Operating Departments for the selection of proper cars.

Over recent years improvements have been made in freight car equipment many of which have eliminated or reduced interior damage to equipment, such as the application of permanent lading anchors.

However, shippers should be made familiar with the fact that many box cars are equipped with permanent lading anchors, it being noted in some cases when car was equipped with permanent lading anchors at inside lining and specially designed door posts for high tension band securement, but shipper failed either to observe or use same and secured the bands to the lining with temporary band anchors, which in turn caused damage to inside lining.

The cooperation of the Transportation Departments of all railroads is very essential in order that cars carded for higher commodities will not be misused for a lower class commodity, thereby reducing the number of cars in high-commodity service.

Some misuse of equipment is due to cars being unloaded with one type of commodity and reloaded with another without having been reinspected.

Commodity inspection by car inspectors is highly important and at all times car should be commodity carded for its highest commodity, regardless of what it may be used for.

It is also recommended that, at large terminals particularly, every effort be made to select car inspectors specifically trained in the classification of cars, who know the requirements of the various shippers in his territory, so that cars may be distributed more effectively.

Side doors on box cars should be closed and latched at all times after being classified, both as a matter of safety and to keep interior of cars clean and dry.

The cooperation of consignees should also be urgently solicited in the complete unloading of cars released by them for the reason that when cars are released, not properly cleaned or dunnage removed, there is a possibility of car being reloaded without being properly cleaned.

When special orders are placed by the Transportation Department for certain types of equipment for specific loading, Car Department should be advised in all such cases so that only proper equipment will be selected; this may prevent the back haul of cars from points where cars later may be inspected and found unsuitable. Cases are known where other departments have failed to notify the Car Department and no inspection was made of equipment before movement, resulting in unnecessary switching, mileage and per diem.

In our report, we are specifically reporting on the maintenance of box cars for high commodity loading by repairs of parts standard to the car, however, during peak seasons, such as the movement of grain, etc., it is the common practice of most railroads to make many cars temporarily suitable for such loading by the application of suitable liners of various types which are nominal in cost and thus make thousands of cars suitable that may otherwise not have been upgraded. However, many cars, so upgraded temporarily, will not be used by certain shippers, their contention being that the liners (or other temporary methods of coopering cars for grain loading) are apt to cause damage to their equipment when cars are unloaded.

(The report was presented by Chairman T. E. Hart, chief car inspector, New York, Chicago & St. Louis.)

EDITORIALS

Fall Conventions in Retrospect

The Life of the Meeting

The program of the Railway Fuel and Traveling Engineers' Association at the September meeting at Chicago was of high quality. This was as much due to the range and pertinence of the subjects covered as to the quality of the individual reports and papers. But there was one weakness. The number of subjects covered was so large that no time was left for discussion. The one exception was the session at which the Air Brake Association joined with the Railway Fuel and Traveling Engineers' Association to listen to and to discuss a comprehensive report on train handling of equal interest to the members of both bodies. The report was long but it was the only one on the program for that session and there was time for an extensive and spirited discussion. A number of questions pertaining to various features of train handling concerning which some of the audience were seeking light were asked and answered from the floor. There was evident in the tone of the discussion a feeling of satisfaction with the result.

As the annual meeting drew to a close the need for time to discuss all reports, even at the expense of presenting fewer of them, was commented on from the floor and assurances were forthcoming that the program next year would be planned so the members, both those present and those who will later study the proceedings, will not be deprived of the value of the discussion. Some reports are written with the purpose of bringing out discussion and without it the reports themselves are of little value.

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Adaptability Pays Off

Back in 1902 when a small group of boilermakers from the railroad field got together to form what is now the Master Boiler Makers' Association they couldn't even have dreamed that when the organization celebrated its 50th Anniversary, which it has this year, the steam locomotive, even then an "unrefined" type of motive power would be on its way out of the picture. We might say, incidentally, that the use of the term unrefined was an easy way of saying that in 1902 the major refinements that made steam power what it was before the diesel took its place were yet to come.

So, the MBMA, in 1952, found itself in a position of having to celebrate its golden anniversary by starting life all over and one need only glance at the program of the '52 meeting and know a little bit of the background of the committee work of the past two or three years to become immediately conscious of the fact that here is an association that not only has had to make drastic changes to "keep up with the times" but to guarantee its future existence has had to find ways of adapting its work to the needs of a group of people faced with the problem of maintaining an entirely new type of power. As the use of diesels expanded in came problems in welding, of maintaining fuel and water tanks, and a new form of "boiler" in the steam generator. We predict there will be many other things in the days to come where the specialized knowledge of the "boilermaker" will be badly needed.

Adaptability to changing conditions always pays off and the substantial membership increase which the MBMA has experienced this past year is proof that they're on the right track.

It might also be worth while to pause and reflect that an organization is rarely much better than its secretary and, for 22 years, the M.B.M.A. has been fortunate in having one who always has looked ahead.

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Next Year in June

The Electrical Section is now a single body whose function is to develop new information, recommended practices and standards covering electrical equipment for both the Mechanical and Engineering Divisions of the Association of American Railroads. It now employs a full-time secretary and its 1952 reports all appear in one cover. In 1953, it will meet in June, in Atlantic City while the A. A. R. Mechanical Division is in session. This will preclude a joint meeting with the Locomotive Maintenance Officers Association, but this should entail no lack of cooperation. It is extremely difficult to ac-

complish much in so large a joint meeting. The committees of direction or executive committees must assign work to the technical committees, and these assignments should be made so that work is not duplicated by the two bodies. Where there is a mutual interest, effective co-operation can be obtained by extending invitations to the other body to participate in committee work. It is in the committees where most of the work is done. A highly important function of the Electrical Section is to provide information on electrical subjects to other railroad departments. To fulfill its constantly increasing responsibilities, it will obviously be necessary to increase membership, to enlarge committees, and to extend the scope of the Section's work.

Getting Down to Business

Some indication of the value of the Locomotive Maintenance Officers' Association to the railroad industry is the fact that attendance at the 1952 sessions exceeded those of previous years and its total paid membership at this time has held up to a total where it is still one of the largest, if not the largest, association in the industry.

A year ago, in commenting on last year's meeting, we suggested that the very size of the organization imposed upon it an unusual obligation to broaden its viewpoint and make doubly sure that the work it was doing was of unquestionable value not only to its members but to the industry which they represent. The committee work of the L.M.O.A. has been improving for five or six years and there is indication that it is reaching a point where committee reports no longer represent the opinions of a relatively few railroad men but are an accurate cross-section of the thinking in the industry concerning the subject under discussion. If no other report presented as this year's L.M.O.A. meeting was of value, the survey on diesel facilities (which appeared in our October issue) was a job well done and one which the industry has needed for some time.

Not satisfied with this, however, other reports such as the one on apprentice training and the one on locomotive cleaning are samples of excellent committee work.

An organization as large as the L.M.O.A. has no choice except constantly to improve the quality of its work and its performance in 1952 seems to indicate that it is seriously getting down to business.

Become Better Salesman

Of all the qualifications for a supervisory job, selling ability ranks among the least necessary in the minds of most supervisors. Yet the ability to sell can be one of the most valuable attributes of any railroad officer, and at the same time enable him better to serve his department and his railroad generally.

So spoke J. W. Hawthorne, general superintendent of motive power and equipment, ACL, in a talk before the Air Brake Association. Too often, Mr. Hawthorne pointed out, the air-brake officer's request for new maintenance facilities or equipment, or for additional men, is turned down because he does not present the advantages of his request in terms that management can understand.

What must be avoided, Mr. Hawthorne continued, is the presentation in highly technical departmental terms. Instead, the departmental supervisor should phrase his request in terms of the dollars it will save, or how it will aid in avoiding delays and getting trains over the road better, always using language clear to the management man who has no detailed knowledge of air-brake equipment.

Certainly nobody could have attended this year's air brake meeting without returning to his job with ammunition to help him sell his management on needed improvements for the air-brake department. Roughly half the papers dealt with problems having a direct bearing on overall railroad operation, or at least on overall mechanical-department operation—two on leakage, what it does, how it affects train handling, how to measure and correct it; one on the release control retainer as a means of better braking; and one on standardization of locomotive air brake equipment. The remainder bore perhaps only indirectly on overall operation, but still contained a wealth of good information to help the air-brake man not only in his own departmental work, but through bettering his department's operation, to contribute more effectively to the running of his railroad.

Car Men Discuss Hot Boxes

No group of railway car men can get together today without starting some discussion of hot boxes, and the 12th annual meeting of the C.D.O.A. at Chicago in September was no exception. As reported elsewhere in this issue, a well-rounded program of addresses and committee reports on other subjects was presented, but the report on car lubrication was the one which seemed to develop the greatest diversity of opinion and comment.

As a matter of fact, the discussers of this particular subject included one railroad president, one research director, one engineer of tests, one superintendent of motive power, four car-department heads, two master car repairers and one general supervisor of car inspection and maintenance. And what did these men have to say about hot boxes?

Obviously, they didn't *solve* the problem, which is essentially unsolvable, inasmuch as it will never be possible to eliminate bearing failures entirely, regardless of what type of bearing is used and how thoroughly bearings are guarded in operation. The urgency of the need for improving present bad conditions was strongly emphasized, however, and most of the remedies quite thoroughly discussed, pro and con.

The case was well summed up by Ward Messimer, C.D.O.A. president and this year's presiding officer, who said railway executives have challenged the association to fight hot boxes at the last three annual meetings and

"Present reports indicate we are making little headway." In confirmation of this fact, he cited the case of a representative railroad which experienced an increase of 22.5 per cent hot journals in June, July and August, 1952 over 1951, and this in spite of a decrease of 11.1 in cars handled. On the basis of hot journals per 1,000 cars handled, the increase was actually 38 per cent. The total number of hot boxes on all roads was referred to as "appalling" and a serious deterrent to good railway service, net earnings and ability to meet competition.

As suggested by President Messimer, the time-worn contentions that oil is inadequate, packing not what it should be, better bearings needed, also more and better workmen, more time to do the work, cooler operating temperatures, etc., which are repeated from year to year, offer little hope of relief in a difficult situation if attacked singly. If all are subjected to the combined brains, experience, initiative and ingenuity of the railway and railway supply industries, however, it is inconceivable that real progress will not be made in controlling hot boxes within reasonable limits.

One of the plain bearing design characteristics sometimes overlooked but emphasized by President Messimer is the influence of high unit bearing pressures on lubrication failures, as is the case when new brasses are applied to journals worn to the smallest diameter allowable. With a new brass radius up to 9/32 in. larger than the minimum journal radius, what constitutes practically a line contact between the two, steps up the unit pressure drastically. That this is something more than a theoretical objection is suggested by a study of 213 lubrication failures during June and July, 1952, which showed only 10 or 4.7 per cent occurred on full-size journals, seven of these happening two days after the application of new brasses. Also, fewer hot boxes generally are experienced on new cars with full-size journals.

The C.D.O.A. holds regular meetings only once a year and hence cannot participate very actively in what is essentially a day to day fight. A constructive effort would be to make the great combined experience of its officers and particularly its lubrication committee available throughout the year to every agency combatting the hot-box evil. It is also suggested that the value of annual meetings can be still further increased by cutting out generalities in all reports, including that on lubrication, bringing up specific facts, getting the concensus of the association on disputed points and thus developing recommendations which will carry real weight.

New Books

THE MEASUREMENT AND CONTROL OF TEMPERATURES IN INDUSTRY. *By R. Royds. Published by the Chemical Publishing Company, 212 Fifth avenue, New York 10. 260 pages, 5½ in. by 8½ in.; cloth bound. Price $5.*

This book is a revision of one first published under the title of "The Measurement of Steady and Fluctuating Temperatures." The latest developments in temperature measurement and control best suited to the metal chemical, petroleum, rubber, and other industries are described and discussed in turn. The standardization and automatic control of temperatures in industry is discussed at some length, and attention is given to improving the quality and reliability of industrial products, an increased rate of production, and the saving of fuel and labor by the application of automatic temperature controls. The eight chapters of the book contain many illustrations and graphs, tables, and numerous equations for calculating results.

MECHANICS—PART 1: STATISTICS; PART 2: DYNAMICS. *By J. L. Meriam, associate professor of engineering design, University of California. Published by John Wiley & Sons, Inc., 440 Fourth avenue, New York 16. 340 and 672 pages, respectively. 6 in. by 9¼ in.; cloth bound. Price each volume $4.*

Statics integrates the usual pre-engineering background of physics, mathematics and graphics. It progresses in easy stages from fundamentals to advanced theory, with emphasis on the importance of principles and problems which apply them. Its seven chapters discuss Force Systems, Equilibrium, Structures, Distributed Forces, Beams, Friction, and Virtual Work. *Dynamics* covers in its six chapters Kinematics; Principles of Kinetics; Force, Mass, and Acceleration; Work and Energy; Impulse and Momentum, and Periodic Motion. It presents a large selection of problems which illustrate wide application to the various fields of engineering. Answers are given to approximately two thirds of the problems presented in each book, with keyed figures to clarify the particular problem described. Moments of Inertia of Areas and of Mass are discussed in Appendix A of each volume, with Useful Tables included in Appendix B.

METALLURGY FOR ENGINEERS. *By John Wulff, Howard F. Taylor, and Amos J. Shalor, Department of Metallurgy, Massachusetts Institute of Technology. Published by John Wiley & Sons, 440 Fourth avenue, New York 16. 624 pages, 5½ in. by 8½ in. Cloth bound. Price $6.75.*

The first half of the book, which is written from the engineering rather than the shop viewpoint, explains the concepts and principles that underlie metal processing from ingots to finished articles of commerce. The second half deals with the processes themselves. The solidification of metals receives considerable attention as well as how the principles of metallurgy are applied to design and fabrication. Structure and properties of metals, impurity and solubility, alloys of carbon and iron, heat treatment of steel, powder metallurgy, and various welding processes are the subjects of other chapters.

The opening session of the Electrical Section's first meeting

Unified Electrical Section Holds First Annual Meeting

Single body now representing the electrical interests of both the Mechanical and Engineering Divisions, A.A.R., presents reports on applications to both rolling stock and fixed property

Chairman H. F. Finnemore makes his opening address

R. I. Fort accepts the nomination to serve as Vice Chairman during the coming year

CLOSE coordination of all electrical work done in both the Mechanical and Engineering Departments of the railroads was evidenced at the annual meeting of the A.A.R. Electrical Section, held at the Hotel Sherman, Chicago, September 15-17. An impressive exhibit of manufactured electrical products was staged by the Railway Electric Supply Manufacturers Association. The Coordinated Mechanical Associations held their annual convention at the same time with meetings at the Sherman and nearby hotels.

The first session of the Electrical Section was called to order at 10:00 a.m., Monday, September 15, by Chairman H. F. Finnemore, chief electrical engineer, Canadian National. In his address to the Section, Mr. Finnemore said that with the advent of the diesel locomotive, which is at least half electrical, and with air conditioning and a multitude of other things electrical, there is a need on the railroads for many technically-trained men. The situation, he said, has called for a coordination of things mechanical and electrical. The reports, he pointed out, are of a new high standard this year.

The most urgent need of the Section, Mr. Finnemore said, is new members, particularly young men. Membership in the Section, he said, will allow the young man to meet older men at his own level where he may benefit by their experience, and take an active part in railroad affairs. Membership, he said, is an apprenticeship to leadership and is really an essential part of a railroad man's job. There is, Mr. Finnemore said, no limit to the

number of members who may serve on a committee. A current problem, he said, is the consolidation of the Engineering and Mechanical Section manuals since the two Sections have combined. Following Mr. Finnemore's address, the incoming chairman presented him with a memorial gavel and a gold badge in recognition of his services to the Section.

Election of Officers

Officers elected to serve in the coming year were as follows: *Chairman:* C. A. Williamson, electrical engineer, Texas and New Orleans.

Vice-Chairman: R. I. Fort, diesel instructor, Illinois Central.

No new members were added to the Committee of Direction, since its membership is larger than necessary, being made up of members of the Committees of Direction of the two former Sections.

H. P. Wright explains some of the damages caused by electrolytic corrosion

C. R. Troop presents the report of the joint Committee on Wire, Cable and Insulating materials

Wire, Cable and Insulating Materials

The first technical report to be presented was that of the Joint Committee on Wire, Cable and Insulating Materials. The report deals with revisions of specifications for various types of insulated wire and concerns coordination of standards with other bodies, namely the American Society for Testing Materials, the American Standards Association, and the Underwriters Laboratories.

The report was presented by C. R. Troop, assistant engineer, New York Central.

In the discussion, J. F. Partridge (N.Y.C.) reported that his railroad is now using all neoprene insulated wire on circuits carrying less than 150 volts. K. H. Gordon (P.R.R.) said his railroad is using all neoprene insulated wire on new electric freight locomotives, and that it is serving very well as control circuit wire. Concerning different arrangements of stranding, the discussion disclosed the fact that in some cases the selection of strand wire sizes makes a wire with one size rating, nearer in cross section to another size.

Electrolysis

The report of the Committee on Electrolysis was presented by H. P. Wright, assistant electrical engineer, Baltimore & Ohio. The report calls attention to the increase in number of failures of underground structures, buried pipe and cable which were near formerly electrified street-railway tracks. In numerous areas, transit companies have abandoned electrified track and operators of other structures are finding that the removal of the stray railway currents has allowed the weaker currents of natural corrosion to flow unopposed.

Comparatively few railroads have an organization set up to handle electrolysis or corrosion problems affecting their buried structures. With the addition of recent extensive underground diesel oil facilities to present water and gas mains, etc., on railroad property, the report states it behooves railroad management to take the necessary steps to reduce or stop the ravages of corrosion by proper application of modern methods. Corrosion weakens structures and entails costly repairs or replacements.

Reference is made to the experience of utility companies which have materially reduced the ravages of electrolytic corrosion by means of ground rods, cathodic protection and the replacement of damaged cables with cables having non-metallic sheaths.

Several years ago, the Southern Pacific applied cathodic protection to a number of steel water tanks and the effectiveness of this protection will be covered in a subsequent report of this Committee.

In presenting the report, Mr. Wright said it is common practice to have pipes and tanks destroyed by corrosion and replaced with nothing done to prevent the corrosion. Further study and application, he said, should pay real dividends, since the situation has been made especially important by many new diesel fuel supply installations. In one instance, he reported, a railroad discovered that shortly after an installation was made, it was losing more oil than was being used. The installation was made with bare steel pipe buried in the ground. W. E. Ripley (N.Y.C.) was asked to show a plaster cast of a pipe which had been installed with a protective covering, but in which corrosion had eaten into the pipe at least a quarter of an inch.

In response to a question about how corrosion of a utility property increased after the abandonment of a nearby street-railway, Mr. Wright explained that the railway return so shifted ground currents as to cause a deposit on the utility company's buried structure and that afterward the currents of natural galvanic action were allowed to take over and destroy the metal.

S. R. Negley (Reading) asked how effective the Southern Pacific's tank protection could be with varying levels of water in the tanks. Mr. Wright replied that it applies to the entire area of the tank, but is expensive since it uses platinum wire. It has not, he said, been in service a sufficient time to prove itself. He told about a leak appearing about two feet from the ground in a water tank on his railroad, and how investigation showed there was not much tank left. We are, he said, doing away with most of our large water tanks, but are installing many oil tanks. Chairman H. F. Finnemore asked if a pipe line having cathodic protection which parallels a railroad might affect signal operation. Mr. Wright replied that it could, and that cooperation between the two companies is essential. The National Society of Corrosion Engineers, he said, is doing valuable work and he suggested the committee should follow their activities and work with them.

Reference is made to valuable information contained in reports presented to other societies also concerned with this subject. Two of these reports, presented to the National Association of Corrosion Engineers, Milam Building, Houston, Texas, are respectively, "Report of Correlating Committee on Cathodic Protection, July 1951" and "Design of Anode Systems for Cathodic protection of Underground and Water Submerged Metallic Structures, April 1950". A third paper recommended is "Reference Book on Instruments for Electrolysis, Corrosion and Cathodic Protection Testing", American Gas Association, 420 Lexington Avenue, New York 17.

S. R. Negley outlines developments in the field of corrosion resisting materials

C. J. Wallace tells how five New Orleans terminals will be consolidated into one

Corrosion Resisting Materials

The third technical report presented was that of the Committee on Application of Corrosion Resisting Materials to Railway Electrical Construction. The report states that no new developments have come to the attention of the committee concerning the use of coatings for application to hardware in service, with the possible exception of a new synthetic material being advanced for coating of pump impellers and condenser tube and sheet protection. It consists of a neoprene base coating impervious to alkali and acid as well as moisture which is applied by repeated coatings either by brush, by spray, or by repeated dippings to obtain the desired thickness.

The use of this material would have application to those items of hardware or line material subject to unusually corrosive atmospheres such as tunnel construction and particularly such items as could be processed in a shop or headquarters prior to installation.

It is believed the material while suitable for the above mentioned applications, would bear investigation for any application where corrosion problems are sufficiently severe to warrant its use. For those interested in a more detailed description of the material, inquiry may be addressed to Synco Corporation, Box 151, Emmaus, Pa.

The report also suggests that, because it involves such a wide field other than electrical construction, the study of the corrosion of metallic structures exposed to diesel locomotive exhaust be referred to the Research Division, A.A.R. S. R. Negley, electrical engineer, Reading, chairman of the committee, presented the report.

New Orleans Union Passenger Terminal

A special report on the New Orleans, La., Union Passenger Terminal, now under construction, was presented by C. J. Wallace, manager of the terminal, and J. M. Trissal, assistant chief engineer, Illinois Central. Mr. Wallace presented an overall picture of the terminal and its function and Mr. Trissal provided a technical description of the facilities. A consolidation of rail operations in New Orleans was necessary to relieve traffic congestion. The terminal will replace five passenger stations with one, and will reduce the number of railroad-street grade crossings from 144 to 27. Both locomotive and car maintenance and servicing facilities will be included.

J. M. Trissal described the electrical features of the New Orleans Terminal

The situation afforded a rare opportunity for the designers, since there were none of the usual restrictions. The terminal could be designed without having to place equipment to fit into existing buildings to conform with platform widths, to meet existing operating conditions, etc. A few of the electrical features are as follows: Battery charging will be done by portable charging sets operating from the 220-volt standby power. Double 100-amp., standby power outlets will be located at 160-ft. intervals. Portable cables will have three power conductors and three ground wires. Everything possible will be placed above the ground because of ground conditions in New Orleans—some of the city lies below sea level. The 1,500-kva. transformers in the station allow for 10 hp. from each standby outlet simultaneously. A similar arrangement will be used in the coach yard. The lighting system provides good illumination on the platforms. Secondary distribution cables are run over the platform canopies, and are carried on the lighting standards. Lighting fixtures in the yards consist of three, 400-watt mercury lamps on each pole. There is one on the pole and one at each side on a 28-ft. arm over the tracks. All transformers and cables are mounted overhead because of water conditions. The arrangement also avoids the use of valuable platform space. Both speakers showed diagrams and colored pictures on the screen to indicate the present status of the construction work.

Power Supply

The report of the Committee on Power Supply was presented by C. P. Trueax, assistant electrical engineer, Illinois Central. The first section of the report prepared by L. C. Bowes, electrical engineer, Rock Island, shows that their diesel locomotive service shop, capable of handling 30 to 35 single diesel units per 24-hr. period, requires a total connected electrical load of 350 hp.

The second part of the report, prepared by H. A. Hudson, signal and electrical superintendent, Southern, concerns generating equipment for roadway tools. The committee will send out a questionnaire on this subject and attention is called to reports on this subject, appearing in the A.E.R.A. proceedings, pages 253 to 255, 1943, and pages 347 to 350, 1949.

Section 3 of the report, compiled by G. L. Sealey, assistant engineer, Reading, points out that where standby power exceeds the capacity of 100-amp. plugs and receptacles, the load may be carried through two or more wayside receptacles connected to duplicate receptacles on the cars. Where trouble has been experienced with magnetic trips, with settings of 170 amp. minimum, and 480 amp. maximum, the report states that for such cases there are available for mounting in the standard 100 amp.

C. P. Trueax conducts the presentation of the report of the Committee on Power Supply

frame breaker, adjustable magnetic trips with a trip range of 450 to 1,200 amp.

The air conditioning standby distribution system at the Jacksonville, Fla., terminal is described in the third section of the report, prepared by C. S. Stringfellow, assistant engineer, Atlantic Coast Line. The system provides 220-volt, 3-phase, power to the cars of all tenants in the yard, and is so engineered that it is not necessary to have cables cross platforms or tracks. It is, in fact, four separate systems, each serving a particular terminal area, and will meet load requirements of a 30-hp. standby motor per coach, or in the case of dining cars, two 30-hp. motors per car. A total of 132 duplicate receptacles supply power to the cars and these are fed by four substations having an aggregate capacity of 1,575 kva. The 750-kva. substation which is the largest of the four, is shown in the illustration.

Equipment for Fuel and Sanding Plants

To determine what type of electrical equipment should be used for diesel fuel and sanding plants, a questionnaire was first sent to railroads and 56 replies were received. The results are compiled in the fourth section by R. H. Herman, engineer shops and equipment, Southern. In this type of installation state regulations do not govern the type of equipment used in most installations. Explosion-proof motors and motor controls have the greatest acceptance for driving oil pumps. Opinion is divided on pushbutton station enclosures, 15 using N.E.M.A. Type VII enclosures, 18 using N.E.M.A. Type I enclosures and 9 using N.E.M.A. Types III and IV. For disconnecting switch or circuit-breaker enclosures, there is a similar division, 16 using Type VII and 21 Type I enclosures. In both cases, a number of railroads did not reply. Concerning grounding, replies showed a preference toward N.E.C. standard grounding. Most of the lighting fixtures used are either explosion proof or vapor proof.

Present practices for lubricating oil reclamation plants are apparently similar to those for oil storage, a few going to Class I Group D equipment, because of the elevated temperatures involved. For sand plants, the expressed preference is for totally enclosed motors and dust-tight control enclosures. Vapor-proof lighting fixtures are preferred for sand houses.

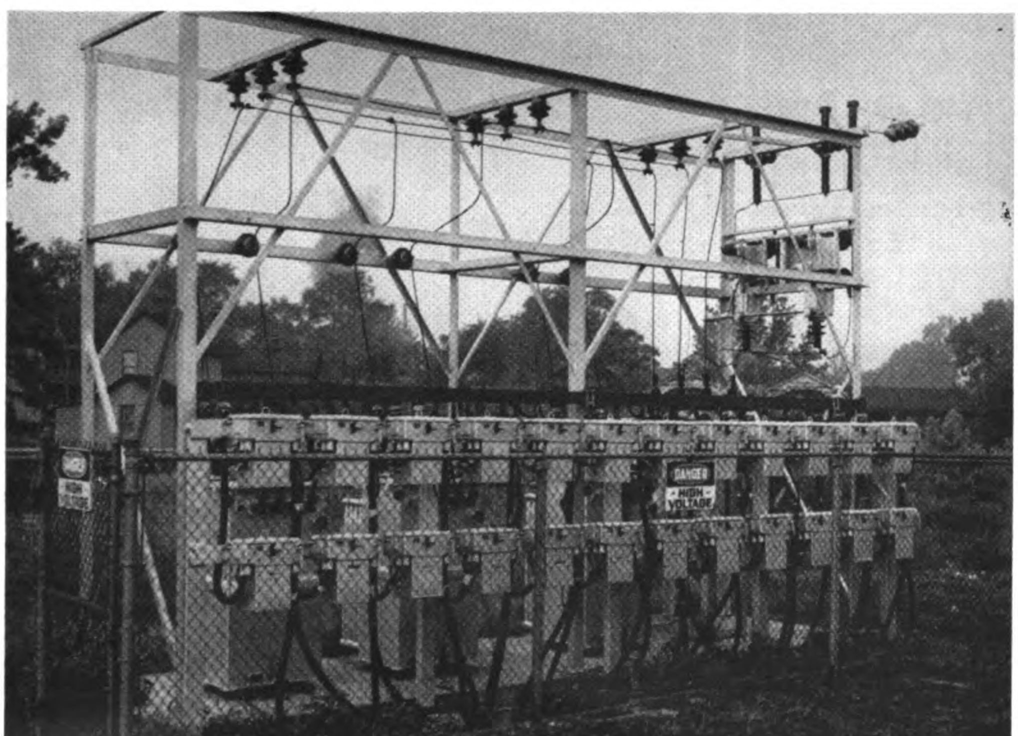
The final section of the report, prepared by A. L. Veith, assistant electrical engineer, Wabash, describes a fuel and sanding plant for diesel locomotives on the Wabash at Moberly, Mo. The oil storage consists of one 100,000-gal. steel tank to which a 500,000 gal. tank is to be added.

Following the presentation of the report, the relative meaning of the terms flammable and inflammable were discussed and the explanation was offered that they are really the same but that the term flammable was generally replacing the other.

In reply to a question concerning ways of insuring that fuel pumps be shut off, after a locomotive is fueled, D. M. Burckett (B & M.) said that it has been successfully accomplished by using the by-pass fuel oil temperature as the control medium. D. F. Dunsmore (C. & O.) said that the use of flow switches was being considered by his railroad.

Electric Heating

The report of the Committee on Electric Heating was presented by C. A. Williamson, electrical engineer, Texas & New Orleans. The first part of the report, prepared by H. C. Cross, engineer electrical construction, Baltimore & Ohio, deals with electrically-heated glass windshields used in New York Central m.u. cars. It supplements the previous year's report on this subject and adds the information that current to these glass panels



The 750-kva., 13,200-volt Jacksonville Terminal substation showing the twenty-four 300-amp. oil circuit breakers for the 240-volt feeders

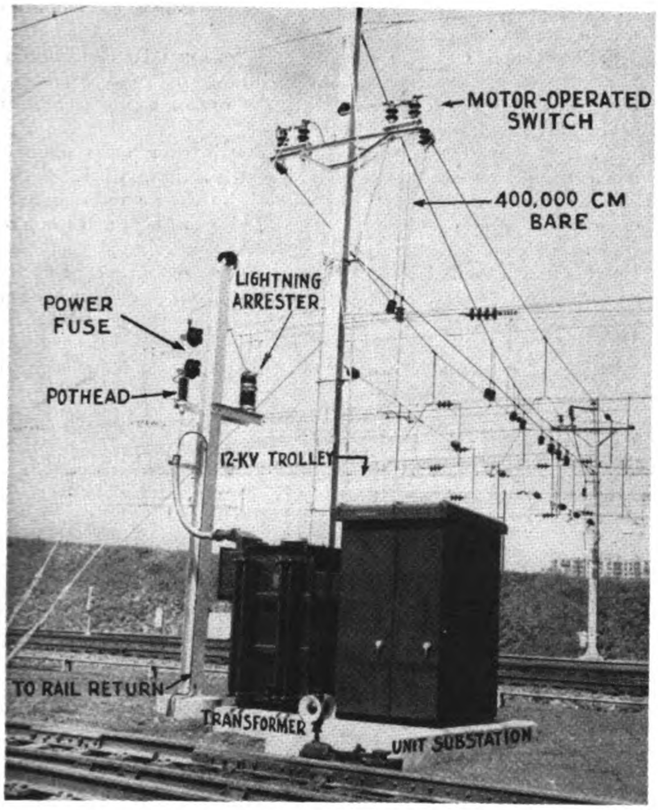


Fig. 2—Unit substation power supply

C. A. Williamson, Vice Chairman of the Section, also presented the report on Electric Heating

is supplied at 110-volts, a.c. from a motor alternator operating from a 64-volt battery. The current is about 1.5 amp. and this will raise the surface temperature of the glass 20 to 30 deg. F. above the outside temperature.

The second part of the report, signed by H. C. Griffith, Jr., electrical engineer, Commercial Section, Transportation Divisions, General Electric Company, describes an application of electric strip heaters to a transfer car for the purpose of thawing frozen ore. This installation was described in the July 1952 issue of *Railway Mechanical and Electrical Engineer*, Page 90.

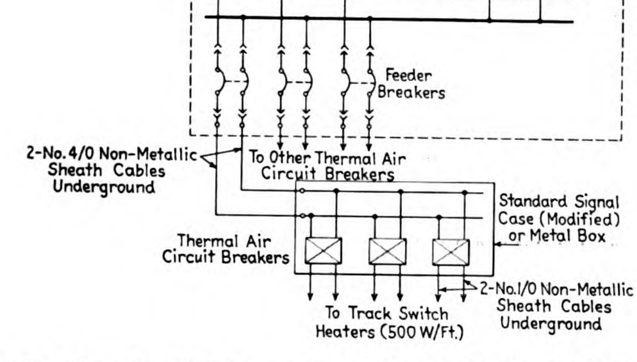


Fig. 1—Schematic wiring diagram for typical unit substation supplying power to electric heaters for track switches

Power supply for electric heaters for track switches in electrified territory on the Pennsylvania is the subject of a section of the report signed by L. B. Curtis, assistant engineer, Pennsylvania. It describes an installation in which power is supplied directly from the 12-kv., single-phase trolley circuit. The transformer used is rated 550 kva. and power is fed to switch heaters at 480 and 240 volts. A wiring diagram is shown in Fig. 1 and a picture of the installation in Fig. 2.

Recommended standard specifications for tubular type electric heaters for track switches have been compiled by a sub-committee of six of which E. B. Hager, assistant engineer, Illinois Central, is chairman. These are complete in detail and constitute the final section of the report.

In the discussion, R. I. Fort (I.C.) raised a question about the wattage used in windshield heaters, and it was pointed out that it had been selected to suit the weather requirements of the New York City area. S. B. Pennell (N.Y.C.) reported that the operation of the heater glass had been trouble-free and completely successful.

J. D. Sylvester asked for the size of the hopper cars to which strip heaters had been applied and Mr. Williamson replied that it was 60 tons.

Asked why more control, as in previous installations, was not used in the one described in the report, L. B. Curtis (Pennsylvania) replied it was a matter of transformers. The old specifications, he said, required special transformers and in recent years it had been impossible to obtain other than standard transformers. He said, it is his opinion that conditions can be met by using different sizes of heaters with standard transformers. S. R. Negley (Reading) said it is necessary to have heaters of sufficient size to allow for the worst weather conditions, and asked how it is possible to avoid getting them of greater than necessary size. Mr. Curtis replied that the committee will make recommendations. He also said that the Pennsylvania has an arrangement whereby the output of a 500-watt heater may be reduced to 125 watts. The A.A.R., he said, is developing information on the use of thermostats for track heater control.

Radio and Communication Systems for Rolling Stock

Specific information covering installation, operation and maintenance of communication systems on locomotives and layout for wiring and equipment are being assembled by the Committee on Application of Radio and Communication Systems for Rolling Stock working with Committee 4 of the Communications Section.

The major part of the report consists of a resume of a paper, "Practical Aspects of Using 12-Volt Power Plants on Radio-Equipped Cabooses," which was presented to the Communications Section by L. E. Verbarg, electronics engineer, Missouri Pacific, in October 1951. The resume is as follows:

Fifteen months' operating experience with 60 cabooses which were equipped with a 12-volt, axle-driven caboose power plant,

W. S. Heath outlines the status of caboose power supply

at a cost of approximately $700 per caboose, indicate that maintenance costs and dependability compare favorably with other systems generally used for caboose power.

The alternator drive consists of a continuous "V" belt axle and idler pulley arrangement with a second upper belt drive to give a 6.7 to 1 drive ratio so that the alternator starts to charge the battery at 12 m.p.h. and full-rated charging is obtained at 20 m.p.h. The only maintenance required for this drive is lubrication of idler pulleys every six months and replacement of belts. The lower or axle drive belt requires replacement every 12 to 18 months while the upper or alternator drive belt shows an indicated belt life of three or four years.

The generating equipment consists of a Leece-Neville Company power plant which includes an alternator, rectifier and regulator and is rated at 14-volts and 75 amp. It is installed entirely above the caboose floor for its own protection and for ease of installation and inspection. This power plant is mounted on single shop-made brackets as complete units which can be exchanged and carried by one man when necessary. To date there have been ten occasions to remove regulator rectifier assemblies; one to replace a burned out control rectifier, two for stuck voltage regulator relay contacts and seven for voltage regulator adjustment. No alternators have been removed or serviced and inspection of alternator brushes indicates that there is no need for their immediate replacement.

Storage battery capacity is provided by two 6-volt, lead-acid cells connected in series, rated at 240 amp.-hr. at the 20-hr. rate. These batteries are commonly used in bus and truck service and are expected to have about four years average life. Radio equipment used is manufactured by Motorola, Inc., and draws 11 amp. at stand-by. No external power converters are needed as the required plate and bias voltages are produced by two small vibrators and a dynamotor, and tube filaments are connected in series groups directly across the storage battery. Each caboose contains 18 receiver and 10 transmitter tubes. No variation in radio operating characteristics has been noticed under any charging or discharging condition of the batteries encountered with a normally operating plant.

Thus, after installation and 15 months' experience with 60 cabooses, it appears that 12-volt caboose installations similar to those described, may offer certain economic advantages over so-called conventional systems. Reduced first cost is apparent now. Reduced maintenance costs due to case of equipment handling and the relatively low cost of maintenance parts seems to be becoming a reality—without sacrifice in dependability or performance of the train radio equipment.

The chairman of the committee is W. S. Heath, electrical foreman, Lines East, Atchison, Topeka & Santa Fe, who presented the report.

During the discussion, A. L. Kelly (M.P.) supplied additional information on the radio-equipped cabooses described in the report. He said that while they had experienced some maintenance problems, the equipment had worked very well. One of their difficulties, he said, arose from the fact that it was difficult to locate a certain caboose in a large yard area. This was largely overcome by establishing a caboose track. He also said that the performance of maintenance work on the cabooses had been largely eliminated by keeping spare parts of the equipment on hand so that practically all the work done on the cabooses was a matter of parts replacement.

S. B. Pennell (N.Y.C.) asked if the Missouri Pacific installation included any battery charging facilities. Mr. Kelly said it did not, but that they were considering the use of a small rectifier charger to avoid moving batteries.

W. J. Madden (Pennsylvania) said that in many areas there is much train movement at speeds less than those used by the Missouri Pacific. Chairman Heath replied that the ratio of axle to generator speed could be increased to give full load at 12 m.p.h.

Mr. Madden said this would increase belt torque and Mr. Heath replied that, if necessary, this could be taken care of by adding more belts. J. J. Schmidt (D. & R. G. W.) asked what effect the voltage variation of 12 to 15 volts had on tube life. Mr. Heath replied they had had no trouble arising from short tube life. The saturable core in the vibrator, he said, holds good voltage.

R. H. Russell (G.N.) asked about the feasibility of using a d.c. generator with a voltage converter. Mr. Heath replied that they have such installations which work very well.

E. J. Feasey explains the work being done to standardized diesel-electric locomotive wiring diagrams

Wiring Diagrams for Rolling Stock

The report of the Committee on Wiring Diagrams for Rolling Stock was presented by E. J. Feasey, general supervisor, diesel equipment, Canadian National. Mr. Feasey explained that the work of this committee was required because different manufacturers had different standards.

The first part of the report recommends a list of symbol numbers for the many electrical devices on a diesel locomotive, these to be incorporated in Section H of the Electrical Section Manual covering wiring diagrams for rolling stock. Thus, the symbol number for a.c. motors and generators is 34, for armatures it is 32, for auto-transformers it is 29, etc.

The second part of the report is concerned with the standardization of wiring diagrams and markings. It recommends that certain pages in the manual concerning gaseous rectifiers be replaced by others included in the report.

Discussion of the report was opened by A. L. Kelly (M.P.), who suggested that special consideration be given to battery leads which come up through the floor. He said that on his road two fires had been caused by shorts in these cables.

H. W. Dillon (T. & N. O.) asked what kind of cable and what kind of circuit protection should be used, saying that it was easily possible to run into starting trouble. R. I. Fort (I.C.) said it is very difficult to provide protection for all circuits. Failures, he said have been caused by deterioration of fuses, and a number of railroads have eliminated battery fuses, special care being given to the battery circuit. He said that for himself, he would rather not use breakers under a locomotive. He also said he did not like fuses for this circuit, but that it might be possible to use link fuses that can carry 1,200 amp. A. L. Kelly (M.P.) said he considered 1,200 amp. to be a modest value, but thought that short-circuit protection was desirable.

Fig. 1—The New York Central's diesel locomotive repair shop at Collinwood, Ohio, during the process of relighting

Called upon by the Chair, P. A. Hatch (General Electric Company) said the first problem is fire hazard. Protection, he said, can prevent fires, but operation of a protective device can cause trouble which may require a shop job. Investigation of the subject, he said, is desirable, but that for the present, no protection is best.

C. W. Martin (B. & O.) said that many of the shop men on his road want detailed as well as schematic wiring diagrams. He said that it is B. & O. practice to place an easel on which were mounted complete wiring diagrams beside a locomotive being wired. This, he said, had proved to be the only satisfactory way to make diagrams available to all men working on different parts of the locomotive.

Illumination

The report of the Committee on Illumination was presented by L. S. Billau, electrical engineer, Baltimore & Ohio. It lists and describes new types of standard and color-corrected mercury lamps which are now available. Concerning the color-corrected lamp, the report states that the advantage anticipated for the lamp is that it will render unnecessary the use of supplementary incandescent lighting on a large scale for such installations where the inherent color of straight mercury lighting is objectionable. Where the inherent slow starting characteristics of a mercury lamp are an objectionable feature, it would still be necessary to install a small amount of incandescent lighting with the color improved mercury lamp to provide some illumination during the starting period of the regular system.

With reference to the application of lamps to shop lighting, the report makes suggestions as follows:

L. S. Billau outlines the present status of the mercury lighting for railroad shops

For railroad shop lighting where high intensities of illumination are desired, the range of sizes of mercury lamps now available is such that for smaller sizes of lamps with relatively lower mounting heights, the use of mercury lamps overlaps the field of fluorescent lamps. Where higher mounting heights are necessary, around 20 ft. to 40 ft. or more, adequate illumination and good light control can be secured with comparatively few lamps, as compared with fluorescent units. This indicates that lighting with mercury lamps, particularly with the color improved lamp, would be preferable to fluorescent lighting. For the very high mounting heights, the mercury lamp only is suitable.

In addition to the new types of mercury lamps, there have also

One of the platforms in the Pennsylvania's station at Philadelphia, Pa.

been developments of incandescent lamps for shop lighting purposes. Filament types of reflector lamps, both of the flood and spot distribution types, in the 150- and 300-watt sizes, have been available for some time. This line has now been extended to include 500- and 750-watt reflector type lamps.

For the illumination of shop areas where it is not considered desirable to provide the higher intensities of illumination obtained with the more costly mercury and fluorescent lighting systems, the use of the reflector type of lamp is growing rapidly. They are particularly suited to shop conditions where rapid accumulation of dust and gases, etc., renders it very costly, if not impracticable, to clean the standard type of steel reflector lighting units.

Concerning the lighting of locomotive repair shops and terminal servicing facilities, the report states that with the availability of the highly efficient mercury and fluorescent types of lamps, it becomes economically practicable to provide very much higher intensities of general illumination for railroad shop lighting than was possible with incandescent filament lighting.

Footcandle intensities recommended for such applications vary from 30 to 50, with 100 for injector inspection, and 1,000 for local lighting for arc welding.

Fig. 1 is referred to in the report as follows: An outstanding example of the ability to secure high intensity general ilumination in a large locomotive repair shop of the high bay type, where lighting units must be mounted above the cranes. This is the new lighting system being installed by the New York Central in its steam locomotive repair shops at Cleveland, Ohio, now being converted for diesel-electric locomotive repair work only. In the high bay area, the installation consists of 3,000-watt mercury lamps combined with the use of reflector type, 750-watt incandescent lamps. The spacing distance of mercury lamps is 22 ft. by 26 ft. with a 40-ft. mounting height. The average illumination is 50 footcandles. The effectiveness of the lighting installation has been greatly increased by painting the interior of the shop a light color. The photograph shows a night view of the high bay part of the shop with the new lighting system in the foreground, and in the background, the original lighting system in the portion of the shop which has not been converted. No doubt when the original lighting was installed in this shop, it was considered good illumination practice and the photograph shows in a very striking way a comparison of older systems of shop illumination with modern lighting systems providing high intensity of illumination.

An example of good station platform lighting is shown in Fig. 2. With reference to this installation, the report states that the illumination of the Pennsylvania's platforms in the station at Philadelphia, Pa., was the subject of an exhaustive study and test to determine the most practicable unit to provide relatively high intensities of illumination, comparable to present day standards of illumination. As the platform ends are open, the temperature occasionally drops to around zero degrees with the consequence that there was considerable question as to whether fluorescent lighting could be used successfully. Various types of lamps and fixtures were tested and the unit finally adopted is an enclosed dust-tight fixture using two 96-in. T-12, 75-watt, 430 mill-ampere slimline lamps, with lead-lag type ballast for low temperature operation.

These fixtures are mounted in two rows, 11 ft. above and 4 ft. from the edge of the platform, on a 7/16-in. steel messenger wire suspended from the ceiling and strung the length of the platform. The fixtures are attached to the messenger on 16-ft. centers, with the two rows staggered to obtain as even a distribution as possible.

Illumination readings taken one month after the initial installation was put in operation showed an average of 23 footcandles along the row of fixtures, and 21 footcandles along the platform edge. After one year of continuous operation, there has been no lamp failure, no cleaning of any kind and illumination has only dropped to an average of 19 footcandles along the row of fixtures, and 17 footcandles along the edge of the platform. Observations made at 9 deg. F. showed no noticeable effect on the output of the lamps.

Discussion was opened by R. H. Russell (G.N.), who stated that warm colors of light made people feel warmer, while the greens and blues make them feel cooler and suggested that this subject be given further study. Mr. Billau said the Baltimore & Ohio has adopted the warm white fluorescent lamp as best for all purposes where fluorescent lamps are used. He added that since new phosphors and new colors had recently been introduced, the committee will continue the study of their effectiveness.

J. J. Schmidt suggested that the 12-watt, 30-volt, No. 1348 lamp should be given consideration for car lighting. M. A. Mortensen (G. E. Company, Lamp Div.) supplemented Mr. Schmidt's suggestion by supplying the specifications and characteristics of this lamp.

P. O. Lautz (A. T. & S. F.) said he would like to see the Committee on Illumination adopt I.E.S. standards or have an interpretation of them for all railroad lighting.

Referring to Fig. 1, K. H. Gordon (Pennsylvania) said that in reality the old lighting shown in the background is almost nothing while the lighting in the foreground, with its new light and clean walls, gives the effect of daylight. The picture, he said, really does not show this effectively.

Car Electrical Equipment

The report of the Committee on Car Electrical Equipment was presented by Committee Chairman, S. B. Pennell assistant engineer New York Central. Referring to the two diesel undercar power plants which have been in service on an Illinois Central diner since October 1951, the report states that performance has been satisfactory and the major improvement made was to change the exhaust outlet from a point under the car to the roof. From October 8, 1951, to March 11, 1952, the units each ran 3,354 hours, each consumed about 4,680 gal. of fuel, used 1.39 gal. fuel oil per hr. and each used 262 gal. of lubricating oil. The average cost of electrical maintenance per day, not including overhead, was $14.48.

One manufacturer reporting to the committee states that ten railroads and the U. S. Army are now using its units, totaling 130 units in service. Of the 130 units, 90 are d.c. machines, being almost equally divided between 32- and 64-volt systems. The remaining 40 units are 220-volt, 3-phase, 60-cycle machines. The manufacturer advises that after a period of four years, it has collected enough data to recommend that the units go into a shop for check-up and overhauling every 7,000 hours of operation.

Another manufacturer advised that seven railroads are now using its units, totaling 26 units in service and 126 units are going to the U. S. Army for use on hospital cars. They recommend the units be shopped after every 6,000 hours of operation. The average fuel oil consumption in normal service is approximately 1½ gal. to 2 gal. per hr.

Two very important features, the report states, have been learned in the operation of diesel engine-driven generator units. One is the necessity of arranging the application so units may be changed quickly, and the other is protecting the fuel tank and fuel lines from freezing.

On the subject of electric cooking, the report announces that six coffee-shop cars, equipped with Radaranges for high-frequency, high-speed cooking go into service this year, four of them having been placed in service on March 17.

In response to an assignment to study protection of flexible cable leads under cars, the report states that until recent years all undercar machines were equipped with cable leads having a soft rubber insulation with braided outside jacket, protected with a canvas boot or rubber hose. Manufacturers now recommend rubber insulated, neoprene coated wire for this purpose, and the committee is also giving consideration to the use of Silastic material.

Suggested practices for working on car electrical equipment are included in the report as follows:

No persons other than qualified electrical workers shall be permitted to test or make repairs to any electrical apparatus.

High voltage may exist on car electrical apparatus and injury may occur if proper caution is not used when handling or testing the apparatus.

Where resilient mountings are used on electrical equipment such equipment must be properly grounded.

Under no circumstances shall equipment other than necessary electrical parts be carried in electrical lockers.

Electrical lockers must be kept in a clean and orderly condition.

This Committee recommends that the Committee on Passenger Car Specifications give consideration to the following items for all cars to be constructed in the future:

1. Larger and more accessible electric lockers for all cars.

   (a) Where room type lockers are used, sufficient room must be provided to permit workman standing and working inside locker (a minimum of 12 square feet).

   (b) Other type lockers should be arranged such that panels can be readily removed and all parts requiring adjustments be easily accessible.

2. The electrical locker housing the switch board, air-conditioning control, and master control panel, be separate from the locker housing the electrical apparatus. Switch board and air-conditioning control panel shall be dead front type with circuit breakers in lieu of knife switches and fuses.
3. Adequate lighting in electrical lockers.
4. Pipe lines, other than electrical conduit, shall not enter electrical lockers.
5. The electric lockers must be properly ventilated to prevent burned out resistors, coils, etc., due to excessive temperatures.

S. B. Pennell presenting the report of the Committee on Car Electrical Equipment

6. All wires should be equipped with approved terminals and identified with markers. The terminal posts must be plainly marked.
7. All contactors, relays, switches, fuses, and resistors must be plainly marked, showing their capacity and use.
8. It is recommended that all applicable N. E. C. rules be followed.

Recommended practice for trainlining car batteries is also included as follows:

Stencil voltage on trainline receptacle cover.

Stencil on, under or adjacent to trainline switch or circuit breaker, the following notice:

STOP

This car has .... volt batteries and must only be trainlined to a car with .... volt batteries

Stencil on inside of locker door as near as possible to trainline switch or circuit breaker, the following instructions:

TRAINLINE INSTRUCTIONS

1. Make sure trainline switches on both cars are open.
2. Apply jumper between cars. Both cars must be .... volts as shown by receptacle markings.
3. Close trainline switch on defective car and on car to which jumper is connected.
4. To trainline through car or cars of different voltages follow procedure outlined above but do not close trainline switch on intermediate car or cars.

In the final section of the report, the committee has developed information and suggestions for a design of generator and motor shaft extensions and shaft materials which will permit interchangeability between the machines produced by the several manufacturers.

Following his presentation of the section of the report on undercar power plants. C. A. Pearman (I.C.) said it is still quite incomplete and will be supplemented in later reports.

In response to a question from Chairman Pennell, J. O. Fraker (T. & P.) said that T. & P. experience with the single unit it has in service, has been very satisfactory. Costs on this unit, he said, have been much lower than those given in the report. Asked if the unit had been overhauled, Mr. Fraker said the engine had been taken down once for observation, but not for overhaul. Mr. Pearman said that costs are largely dependent on type of service, and that it is not always possible to develop daily cost figures.

L. C. Bowes (C. R. I. & P.) reported having 30 units in service, and said the most important requirement is to keep dirt out of the engine intake. Much fine dirt, he said, particularly in the desert, will get into the engine in spite of filters. He feels that it may be desirable to take air for the engine from the car body. Some units, he said, were fitted with new rings after 3,000 hours of service and others after 6,000 hours. Mr. Fraker said they had started by taking air from the car, but now take it through filters because of pulsations set up in the car.

Asked about failures, Mr. Pearman said they had had five, most of which were due to electrical, and not engine, trouble. These, he said, were plant failures, and not car failures. His road,

he said, has had power plants in service using General Motors engines which provide waste-product heating. The only trouble with them, he said, has been due to faulty applications which caused recirculation of air through the engine radiator. One installed in 1937 gave 40,000 hours of service.

R. I. Fort (I.C.) raised a question about grounding of 220-volt circuits on cars, saying he does not like to use them ungrounded. W. J. Madden, (Pennsylvania) said it is his road's practice to ground frames of motors, etc., but does not believe the grounding of circuits would be good practice. A. L. Kelly (M.P.) said the car is grounded and that should be enough. Mrs. Bowes expressed the opinion that it is best to keep grounds off at all times.

G. W. Wall (D. L. & W.) asked about the effect of electric ranges on the heat in the kitchens. Mr. Pearman replied that they reduce the heat considerably, and that he will make measurements. Mr. Fort said that one measurement had been made when the outside temperature was 90 deg. F. A reading taken inside at a point where radiant heat did not affect the thermometer showed a temperature of 95 deg. F.

Mr. C. A. Williamson (T. & N. O.) expressed the opinion that there is need for grounding even if it is only to reduce the phase voltage to that between a terminal and the center of the *Y* connection. Mr. Kelly cited cases in which two men had been tied up by getting between the cable plug and the car. Mr. Fort added that in addition to the personal hazard, a man can get a nasty static shock from an ungrounded circuit. Chairman Pennell said the subject will be further explored.

The report was brought up to date on a request from K. H. Gordon (Pennsylvania) and it was disclosed that the first water-cooled magnetron tubes used for producing high frequency power for cooking had a life of 25 hr., while the present air-cooled tubes are expected to give 1,000 hours of service. The circuits may be readily repaired by television repair companies.

T. G. Isel (Pullman Co.) said that Silastic material is quite expensive, tht it is good for high and low extremes of temperature and asked if neoprene were not satisfactory. Mr. Pearman replied that neoprene jacketed wire is very good under the car, and that Silastic material might meet the needs of very severe conditions. Mr. Dougherty (B. & O.) said canvas boots and cotton braided wire covering had been ruled out on the B. & O. because of fire hazard. Neoprene, he said, is satisfactory. Mr. Wall added that his road has had no trouble due to breakage with tough-covered cables and that ice does not form on their smooth surface as it does on canvas boots. Their life, he said, is years.

In presenting the section of the report on practices for working on cars, Mr. Pearman explained that because of the higher voltages now used, he thought it necessary to place emphasis on the recommendation that no persons other than qualified electrical workers should be permitted to make tests or repairs.

A. E. Voigt (A. T. & S. F.) suggested that the Section might advocate a nationally supplied lock and key with the key only in the hands of electricians so that mops and brooms, etc., would not be kept in the electric lockers.

Mr. Isel pointed out that the committee's proposed rule would allow putting all trainline receptacles in the lockers.

W. S. Weff (F. E. C.) said his road is making safety improvements in all cars having voltages above 32. Lockers have insulated walls, switchboard matting on the floors and protected terminals. The voltage is posted in the lockers and instructions are issued to trainmen to keep out of lockers except in case of emergencies. It is necessary, he said, that they be permitted to get in, in case of fires which may cause smoke. Maintainers, he said, are supplied with insulating aprons to place over exposed parts in lockers. There are also convenience outlets in the lockers to provide light for the maintainers from the battery when the power is off.

P. H. Hatch (G. E. Company) suggested that lockers should be equipped with holders for jumpers and extra fuses. A. E. Lines (S. P.) said his road makes a practice of carrying fuses, connectors and lamps in holders in the lockers. Mr. Pennel explained that this work had been started because there had been fatal accidents caused by unauthorized use of lockers.

After continuing discussion, it was moved and approved that everything but permanently installed equipment be kept out of the lockers of all new cars. L. H. Sulton (S. P.) said that to adequately protect a man removing trainline connectors, his road had issued instructions to open switches before trainlines are removed.

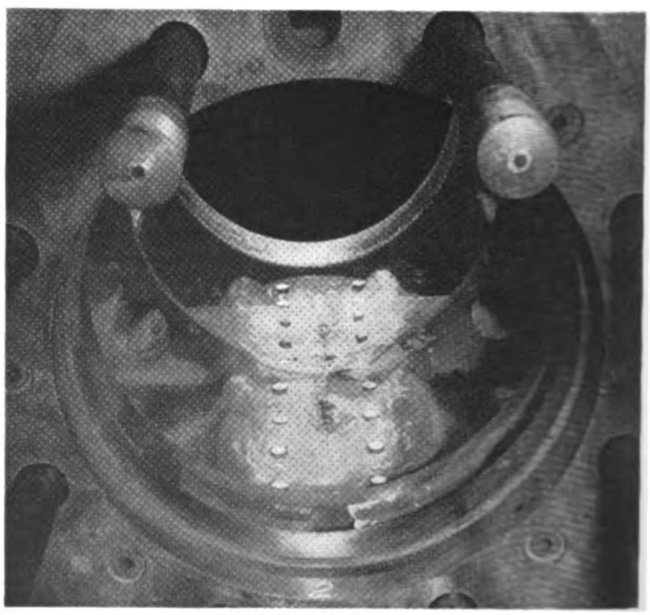
L. E. Grant tells of welding procedures developed for diesel locomotive maintenance

Welding and Cutting

The report of the Committee on Welding and Cutting was presented by L. E. Grant, engineer of tests, Chicago, Milwaukee, St. Paul & Pacific. The report is concerned primarily with welding procedure, and deals with repairing cracked truck frames and bolsters of diesel locomotives including general preparations, welding procedure for Grade A steel castings and low-carbon nickel steel castings and welding fabricated body bolsters.

It also offers procedure for supporting a locomotive body during welding operations, for welding cracks in water jackets of cast iron diesel engine blocks and describes the arc welding of a cast iron diesel engine base. The report includes a number of pictures illustrating these procedures.

Concerning the welding of cast iron engine blocks, the report states that cracks and leaks are caused by freezeups, erosion and cavitation due to high velocity flow of water at restricted points. Erosion, it adds, always takes place on the interior of the vertical outside wall of the water jacket on the camshaft side at the point where the cooling water flows between the outer wall and the cylinder liner. When the leak is caused by widespread pitting, the report states, repair by welding is not recommended, and consideration should be given to metal spraying or other methods. The report was presented at the close of a session and there was no discussion.



One of the several examples of welding described in the report. A defective diesel engine cylinder block showing crack on water side of jacket on camshaft side of No. 2 cylinder. Protruding screws are from plate application on the outside of casting. Crack is associated with corrosion pits

Next Meeting of the Section Will Be Held in June 1953

Secretary S. W. Marras reads the resolution announcing the Section's June 1953 Meeting

A. E. Voigt presents the report of the Committee on Car Air Conditioning Equipment

At the opening of the Wednesday, September 17 session, Chairman Finnemore announced that a resolution had been passed on the day previous at a meeting of the Committee of Direction. He called upon Secretary S. W. Marras to read it, and it reads as follows:

"Be it resolved:

1. That it is the sense of the Electrical Section, Engineering and Mechanical Divisions in annual meeting assembled, that the Section hold its next annual meeting in Atlantic City, N. J., in June 1953, concurrently with the meeting of the Mechanical Division during the Pan American Railway Congress.
2. That this meeting be confined to three days with afternoon sessions on two days.
3. That these three days, preferably be Wednesday, Thursday and Friday, June 24, 25 and 26."

Car Air Conditioning

The report of the Committee on Car Air Conditioning Equipment was presented by A. E. Voigt, car lighting and air conditioning engineer, Atchison, Topeka & Santa Fe. Concerning the heating of passenger train cars, the report includes the following statement.

The heating systems in use on air-conditioned passenger train cars today are not entirely satisfactory. Many of the systems are too complicated, are difficult for maintenance personnel to understand and properly maintain, and involve altogether too many vulnerable features which cause failures, thus resulting in serious passenger complaints and unfavorable reactions to rail travel. Furthermore, the cost of maintenance is altogether too high. Emphasis should be placed on simplification of electrical control.

The most vulnerable and troublesome components of all heating systems are the following:

Thermostats.
Steam radiation admission valves.
Pressure regulating devices.

The report then proceeds to pursue the subject further by describing recently-developed, simplified heating systems. These are the Minneapolis-Honeywell "Economy" Moduflow Car Heating System and the Budd Steam Heating Equipment. The report also describes a Fulton Sylphon development in which mercury-tube type thermostats have been replaced by other types. One of these is a bi-metallic thermostat with quick make and brake characteristics and the other is liquid-filled element which operates a two-pole contactor.

Waste product heating of cars is being studied intensively by the Committee. It reports that there is little conclusive performance data yet available, but describes three systems as applied to a number of cars now in service. One of these is the heating system of Budd rail diesel cars, another is the Vapor waste product heating system as applied to Pennsylvania diners and a Louisville & Nashville business car, and the third an Atlantic Coast Line office car using General Electric equipment.

In all cases, the heat is developed by diesel engines used for driving electric generators. In the case of the Budd car, the engines also are the motive power for the car.

Mechanical refrigeration specifications have been developed in Assignment 5 of the report. These were drawn up to cover electro-mechanical refrigeration for drinking water only, and for combined units for food storage and drinking water purposes.

Recommended practice for the inspection and maintenance of standard Waukesha ice-engine air-conditioning equipment at maintenance terminals is developed in the report by sub-committee No. 7.

Concerning the location of thermometers in food boxes, the report states that due to the variation in construction of food boxes, it is difficult to make a recommendation in regard to the location of thermostats other than to recommend they should not be located too near the refrigerant coils, so as to avoid frost building up on and around the thermostats, resulting in unstable operation. The thermostats should also be in a path of moving air in the boxes. A thermometer of the type which may be mounted through the wall of the box with the temperature indicating dial on the outside, appears to be the most desirable. The dial should be calibrated in degrees and the actuating element of sufficient length to permit placement in the warmest zone in the box.

Specifications for air filter servicing machines constitute the final section of the report.

In presenting the report, Mr. Voigt said that new developments in heating equipment have disposed of nearly all the objections the railroads had.

J. L. Christen (Pullman Co.) questioned the use of the B. M. T. C. thermostat, saying that in his opinion, it is suitable for cooling but too slow for heating. W. J. Madden (Pennsylvania) replied that his road has used bi-metallic thermostats for heating, but that this has not been done in recent installations. They do not, he said, give as close control, and are at times erratic.

Asked if the new Minneapolis-Honeywell system were not oversimplified, R. H. Russell (G. N.) said his railroad has had one car equipped with the system for two years, and that there has been almost no maintenance. He did, he said, replace one electronic relay. W. J. Madden (Pennsylvania) said the Pennsylvania has 10 cars equipped with the system. He said that it must have a. c. power, but that he does not consider it to be oversimplified, and that installation has performed very well. E. M. Sanders (Minneapolis-Honeywell) said that the best guide is the operating experience of the railroads. Such systems, he said, are in operation on 18 railroads, some having been in service for four years. The major problems, he said, have been due to car wiring or mechanical faults in the piping system. R. Dougherty (U. P.) said that Union Pacific trouble is due largely to leakage in piping. A mixture of Prestone and water, he said, is hard to hold. When a system is tight, he said, it is very satisfactory, most leakages occurring in new installations.

During a general discussion of the characteristics of M.-H. Unizone and Moduzone heating systems, D. E. Jones (C. P.) said the Canadian Pacific has Moduzone systems in two roomette cars and that apart from a little leakage in valve seals, they have been highly satisfactory. He also said they provide better control in rooms than can be obtained with individual thermostats.

Mr. Voigt asked if the limited number of controls might cause trouble if a regulator should fail, and C. E. Impey (Vapor Heating Corp.) replied that if a control should fail, the system may be operated manually. Mr. Jones added the Canadian Pacific is trying to limit its Moduzone systems to two controls.

R. I. Fort (I. C.) asked if antifreeze is being used in Budd cars which require about 50 gal. of Coolant. W. J. Madden (Pennsylvania) said he could not answer for the Budd Company, but that the Pennsylvania uses Prestone on its eight diners. Asked about mixing antifreeze solutions, he said, those containing castor oil cannot be mixed with other types without danger of saponification.

W. S. Weff (F. E. C.) asked if the committee had given consideration to the question of making ice cubes on the cars. Mr. Fort replied that the Illinois Central has a large ice cube maker on its electric diner and said the problem of stripping the containers is considerable. They have, he said, tried various kinds of trays but without satisfactory results. When hot water is used, he said, half of the ice is lost. It is planned in the future, he said, to use a continuous type of cube maker. Mr. Weff said the Florida East Coast has also had trouble with cube makers. R. Dougherty (U. P.) said his railroad has no ice cube makers in cars, but that there are continuous cube makers in terminals for supplying cars. When of sufficient capacity, he said, they are too large for use in cars. Mr. Noyer (Pullman Company) said his company had supplied the Pennsylvania with ice cubes and added that new cars have enough power to make them, and in most much slower than the rate at which the thermostats act. Their cases, the car machine must be supplemented by ice from the terminal. Mr. Fort (I. C.) said the Illinois Central also supplies ice cubes from terminals, but that it is good to have some ice-making equipment on the car, and a large storage space for cubes. Asked about storing cubes on the car so they will not stick together, Mr. Fort said, the best protection is to keep the box as cold as possible.

R. I. Fort (I. C.) asked if the sub-committee, in recommending material for gears, had given any consideration to material other than steel. W. J. Madden (Pennsylvania) said the specifications set up were intended only to indicate optimum requirements and did not rule out other satisfactory materials.

T. J. Kenny (Fulton-Sylphon) was asked if bi-metallic thermostats had proved satisfactory for car heating control and he replied that one road has been using them for three years, and another for two, without difficulty. In test, he said, they have operated for half a million cycles with a change of only one tenth of a degree. He said they have been used with 50 per cent-stepped heat control, and that the rate of rise in car temperature is much slower than the rate at which the thermostats act. Their operation, he said, takes about one-half minute longer than a mercury thermostat.

D. E. Jones (C. P.) asked if the committee members thought they should concern themselves with mechanical refrigeration of freight cars, and Chairman Finnemore said this will be explored by the Committee of Direction.

Repair Shop Facilities

The report of the Committee on Electrical Facilities and Practices for Repair Shops was presented by D. F. Dunsmore, assistant electrical engineer, Chesapeake & Ohio. A complete list of the operations required for the general overhaul of a traction motor is given in the report. This is followed by a report on Pennsylvania practices with a flow chart showing successive operations in the railroad's shop at Altoona, Pa.

Additions to the Santa Fe shop are listed in the third section of the report. These will be described more fully in a subsequent issue of this magazine. Several Rock Island shop equipment developments are also listed, and these too will be described in subsequent issues.

D. F. Dunsmore, Chairman of the Committee on Electrical Facilities and Practices for Repair Shops

The report includes a general discussion of the value and importance of seasoning commutators, a subject which is now receiving much attention.

Concerning the need for new shop facilities, the report asks for means of locating broken and craked strap armature coils, means of detecting faulty insulation on laminations, a low cost commutator seasoning machine, a power-driven positioner and a means of contour-grinding gears.

The committee's fourth assignment concerns equipment and methods for testing. The commonly-used methods of testing, such as Megger insulations and high-potential ground insulation testing are listed and reference is made to high-frequency voltage testing of insulation and to surge generator testing which has previously been described in *Railway Mechanical and Electrical Engineer.*

Low-Resistance Ohmmeter Testing

Reference to a new method of testing is made as follows:

There is available a low resistance ohmmeter with a direct indicating cross-coil ohmmeter for measuring low resistance by the fall-of-potential method. A current value preset between one and one hundred amperes at a potential of one volt is passed through the resistance under test through the hand prods of the test leads. The second contact on each prod is for potential readings in the path of the current.

Measurements of resistance from one-millionth of an ohm up to five ohms can be made. Testing on traction motors ordinarily falls in the 1000 or 10,000 microhm range and a low resistance ohmmeter with only these two ranges is available. The bar to bar resistance values can be compared. The resistance of joints between commutator bars and risers or between risers and coil ends at the front end of the armature or between back ends at the rear of the armature can be compared.

High-Voltage Testing

The following excerpt from the report covers a comparatively new and somewhat radical departure from conventional insulation testing methods. It is offered as information and for discussion without the specific endorsement of the committee.

A.c. voltages, because they are easily obtainable, are in common use for testing. In some cases d.c. voltages would be equally effective and often preferable.

It is a known fact that the higher values of alternating current stress causes deterioration of the insulation and the higher the voltage the more rapid is the deterioration. With d.c. over-potentials, the time to failure of insulation is much longer than with a.c. potentials. Every application of high voltage a.c. tends to shorten the life of the insulation. With d.c. testing, the progressive deterioration of insulation is improbable unless a defect already exists. Evidence available indicates that no damage to sound insulation will occur by the application of high voltage d.c. Laboratory tests (of one minute duration) on mica wrappers indicate that an average ratio of two or more for the d.c. to a.c. Peak voltage is required to cause a breakdown. Thus a d.c. voltage of comparable stress to an a.c. voltage will be a smaller percentage of d.c. strength of the insulation. This evidence sub-

stantiates the statement that the risk involved in using d.c. potentials is less than with a comparable a.c. test.

As an example, an a.c. test voltage of 1050 r.m.s. value is equivalent to a peak a.c. stress of 1485 volts. Thus a d.c. potential of 1485 volts would be equally searching to an a.c. voltage of 1050 with less risk of damaging good insulation. The acceptance of 1050 volts d.c. for testing would lower appreciably the possibility of damaging good insulation and at the same time meet the requirements for a test voltage of that value.

High voltage d.c. insulation test sets using the electronic technique are now on the market and can be supplied in several ranges of voltages. One 15 kv. test set has two voltage ranges 0-1.5 kv and 0-15 kv. with current ranges of 0-50 microamperes, 0-250 microamperes and 0-2500 microamperes.

The final section of the report lists specifications for a liquid electrical cleaner which are offered for discussion with the idea of eventually developing a specification for inclusion in the manual.

The discussion was opened by C. F. Steinbrink (C. R. I. & P.) who said that from the descriptions of diesel electrical shops which have been published, it would appear that most of them are larger than necessary. He said that next year, the committee will endeavor to develop an overall layout for such shops. They must be designed, he said, on the basis of what they will become.

C. A. McGough (Service Machine Tool Company) said the first question to answer is, should the railroad have a shop or not? Means, he said, have been developed to make this determination, and added that railroads fall into three categories.

F. M. Nelson (U.P.) called attention to the fact that the shop diagram in the report shows the degreaser in the building and asked if it should not be outdoors. He added that the time in the degreaser should be carefully controlled. Mr. Steinbrink replied that when the degreaser was first installed in the Silvis, Ill., Rock Island shop, it eliminated the need for about 15 men. The State Medical Association, he said, made many tests and decided the degreaser was not hazardous. Private investigators also made tests and drew the same conclusion. Leaving an armature in the degreaser for 10 minutes, and a frame for 7 or 8 minutes, he said, was about the limit since condensation of the vapor stops in this time. He said that motors in service on the Rock Island have been through the degreaser from 4 or 5, to as many as 24 times. It is necessary, he said, to use a satisfactory impregnating varnish.

Concerning unfulfilled shop requirements, Mr. Steinbrink said he did not know any way to detect cracks in armature coils and that there was need for a means of determining faulty insulation between core laminations.

R. I. Fort asked about the test stand for cooling fans, referred to in the report, and Mr. Steinbrink replied that it is for testing the motor, not the fan.

Mr. Steinbrink expressed the opinion that no railroad should rewind an armature without seasoning, and that it is difficult to obtain a suitable machine. Mr. McGough said this problem had come to the attention of his company about four years ago, and that they had produced 7 or 8 seasoning and grinding machines. At that time, he said, it was felt that only one machine per shop would be used. Now, he said, it appears that a railroad would use a number, not only for rewindings, but also for mileage check. His company, he said, is now working on a modified unit which would be a heating and spinning stand only.

Concerning the relative merits of d.c. and a.c. testing, J. W. Teker (General Electric Company) asked how important the former is in view of voltages used on diesel equipment. It is generally recognized, he said, that d.c. motors and generators operate on a.c. current and asked if the committee had taken into consideration the question of overstressing. D. F. Dunsmore (C. & O.) replied that the report does not have committee endorsement, and that the subject will be studied further.

A. L. Kelly (M.P.) said the real problem of cleaning is to find some means of doing it that does not require taking the equipment apart.

C. A. Williamson (T. & N. O.), the incoming chairman, reminded members that the next meeting would be held in June 1953 in Atlantic City, N. J., and said this means that the committee chairmen must start their work immediately. The circumstances, and the time, he said, offer a challenge to produce important material.

C. A. Wilson speaks before the Joint Meeting of the Electrical Section and the Locomotive Maintenance Officers Association

Automotive and Electric Rolling Stock

The report of the Committee on Automotive and Electric Rolling Stock was presented by C. A. Wilson, assistant general supervisor diesel engines, Atchison, Topeka & Santa Fe, and subcommittee chairmen before a joint meeting of the Electrical Section with the Locomotive Maintenance Officers Association.

The first part of the report lists locomotives and locomotive equipment developed recently by the several manufacturers.

The American Locomotive Company's contribution referred to is a 1,600-hp. road switcher equipped with six traction motors, and offered in a weight range from 270,000 lb. to 360,000 lb. It can be furnished with controls suitable for humping and it has adjustable current control for dynamic braking.

Baldwin-Lima-Hamilton developments mentioned include booster units for 1,600-hp. all-service locomotives, an 800-hp. switcher, a system of humping control which permits bringing the engine up to speed at practically no horsepower, improved field shunting, controllers, and a system for improving the performance of the all-service locomotives in the higher speed ranges. This is accomplished by short-circuiting the field of one of the three traction motors on each truck.

Electro-Motive developments referred to are the Model SD-7 six-motor, heavy-duty road switcher, and the MRS-1, six-motor, military road switcher. Other items are automatic sanding and a dynamic brake regulator which prevents overloading the dynamic brake equipment.

Fairbanks-Morse & Company, the report states, has an improved governor, a redesigned brake cooling system, a new exhaust snubber for the C line, and a dynamic-braking, over-voltage relay which prevents overloading of the dynamic brake equipment. Idling speed of the 1,200-hp. engine has been reduced from 350 to 300 r.p.m. with consequent savings in fuel.

The General Electric Company has, during the past year, supplied two 5,000-hp., 11,000-volt a.c., single-phase electric locomotives during the past year, and the first production design of the gas-turbine-electric locomotive has been placed in service on the Union Pacific.

Westinghouse contributions include further testing and development of its 4,000-hp. gas-turbine-electric locomotive, two 6,000-hp., 11,000 volt, a.c., single phase, ignitron type locomotives, using d.c. traction motors, and a 4,500-hp. steam-turbine-electric locomotive being constructed jointly by Westinghouse, Baldwin and Babcock & Wilcox for the Norfolk & Western. The gas-turbine and one of the electric locomotives have sliding bolster trucks.

Nickel-Cadmium Batteries

According to the report of a sub-committee, there are now 96 nickel-cadmium storage batteries in service on diesel locomotives on 22 railroads. Their performance is being studied.

Locomotive Standardization

Standardization of electrical equipment for switching locomotives is being studied. At present a sub-committee is working

on magnet valves, fuel pump motors, cab heaters, defrosters and fractional horsepower motors.

Lead-Acid Storage Batteries

A section of the report on lead-acid storage batteries and compartments for diesel-electric locomotives recommends 420-amp.-hp. (8-hr. rate) batteries with a 1,250 specific gravity for 600-hp. and larger switchers. For road service locomotives having engines from 600 to 2,250 hp., 420-amp.-hr. batteries are recommended. This section of the report also proposes dimensional data for the batteries, properties of hard rubber containers, dimensions of containers and battery compartments, arrangement of containers and means of ventilating battery boxes.

Utilization of Locomotives

Assigned to study maximum utilization of diesel electric locomotives, Sub-Committee C has developed an excellent explanation of why a locomotive behaves as it does with different motor connections, with different gear ratios, with motors and generators of various ratings and with different numbers of motors.

Among other things it explains one thing which is quite generally misunderstood—why a change of gear ratio does not change the speed-tractive force characteristics of a locomotive.

Wheel Slip

Section 4 of the report sets up requirements for wheel slip protective devices. It says, for example, that a detector should be available for all types of locomotives which will give positive indication and protection against (1) wheel slip during acceleration and high speed; (2) wheel slide protection during air and dynamic braking; (3) locked wheel protection.

Due to the different types of diesel-electric locomotives in the service today, this positive protection can be ammoplished by the application of axle-mounted equipment and this can be made standard on all types of locomotives used in all classes of service.

The wheel slip and wheel slide protection device should consist of the following:

1. Axle mounted equipment
2. Relay panel
3. Alarm system

Further details of these specifications are included in subsequent paragraphs.

Battery Charging

The report states that there is much need for preventing battery failures caused by improper charging. On some roads, these have been sharply reduced by training crews to watch battery charging ammeters. Two roads employ battery charging alarm circuits which are included in the report, but the report states these only advise the operator that the battery is not being charged and do not prevent failure. The Electro-Motive Division, the report states is now putting on the market a modification of its present regulator to correct the cause of such failures.

The Santa Fe is now equipping its E.M.D. locomotives with battery trainline receptacles and switches and drawings for these were distributed by the chairman to those who wanted them.

Location of Receptacles

Sub-Committee G is attempting to standardize the location and arrangement of receptacles and jumpers on diesel-electric locomotives. Its report is a general discussion of the subject which includes information on existing practices.

Alarm Signals, Lights and Bells

In making a study of indicating signals on diesel locomotives, by Sub-Committee H, a tabulation was made of replies received from the chief mechanical officers indicating their preference as to function and location of visual and audible alarms. From the tenor of these replies, the majority preference indicates that the following represents a minimum which should be expected, where applicable, from the manufacturers of road diesel-electric locomotives.

1. Color light signals at engine control panel with audible alarm in all units:
(a) Low lube oil pressure (yellow)
(b) Hot engine (red)
(c) Ground relay operated (white)
(d) Steam generator failure (green)
(e) Traction motor blower, radiator fan or alternator failure
(f) Crankcase exhauster (yellow)
(g) Battery charging indicator (white)

2. Trainlined color light signals and buzzer in operating cab:
(a) Low lube oil pressure (yellow)
(b) Hot engine (red)
(c) Ground relay operated (white)
(d) Steam generator failure (green)

3. Trainlined color light signal at control position and buzzer in operating cab:
(a) Dynamic brake limit (white)

5. Color light signal at control position:
(a) Power-off (*PC*) switch operated (white)

Each light aspect shall be marked clearly.

Any railroad may add other signals to meet its individual requirements.

The same sub-committee has under consideration a standard load ammeter and offers an opinion on what it should be. It also investigated shut-down switches and discovered they are commercially available.

Ground Relays

Because many railroads feel that ground relays are too sensitive, Sub-Committee I explored the subject and reported that it appears impracticable to set a pick-up value because of different locomotive designs, different operating conditions and because of the various climates in which they must operate. It also reports that the Pennsylvania is installing surge relays in the generator field circuits on two makes of diesel locomotives to protect main generator against flashovers. The generators are being excessively damaged by flashovers due to lack of any inherent ability of the generator to remove excitation when trouble develops. The ground relays will not respond to a flashover until a serious ground develops from the flash. The surge relay picks up before serious burning of the generator results.

Dust Elimination

To reduce trouble which may be caused by dust in electrical control equipment, Sub-Committee J has the following to offer:

The desirability of eliminating dust from electrical control equipment is very great, but the possibilities are so limited due to the fact that a great number of resistors are mounted in control cabinets with relays, contactors and power switches and should have a circulation of air around them in order to dissipate the heat properly.

It is obvious that control equipment cabinets must be ventilated but any improvement in dirt conditions requires the filtering of the cooling air.

It is recommended that the control equipment cabinets be located convenient to a source of air supply such as traction motor blowers so that air can be circulated through the cabinets. The cabinets should have the control devices grouped so air can be circulated around them and all resistors should be placed in a separate cabinet or outside the present cabinet. The usual amount of dirt which collects on these resistors would not be considered harmful. All cabinet doors should have some sort of flexible seals and a sturdy spring loaded type of latch should be provided to keep the doors closed tightly.

We believe that much can be done in the way of eliminating dust, dirt and moisture from the electrical cabinets. This study is not complete at this time due to the many problems involved.

At the request of Chairman Finnemore, Secretary Marras reread the resolution passed by the Electrical Section on the previous day, by which it was determined that the next meeting of the Section will be held in Atlantic City, N. J., June 24, 25 and 26, 1953.

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Secretary: S. W. Marras.

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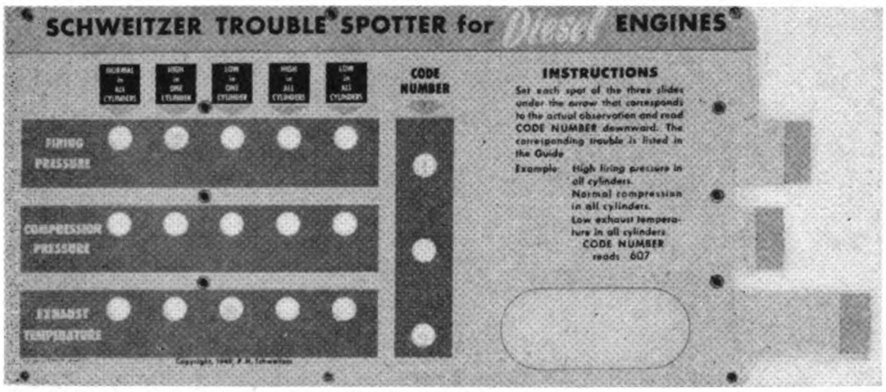


Diesel Engine Trouble Spotter

A new method of analyzing and solving operating difficulties of diesel engines has been marketed in the form of an easy to use Spotter and Guide. The Spotter is a slide rule type of indicator and the Guide is a booklet containing remedies indicated by the Spotter.

Three slides on the indicator, available from Dieselspotter, Fanwood, N. J., show the firing pressure, compression pressure and exhaust temperature conditions. The setting shows a code number which is referred to in the Guide for a non-technical analysis of the trouble and the steps necessary to effect a remedy.

The device is 4¼ by 8¼ in., is protected against water, oil, dust and grime by a transparent acetate envelope.

Corrosion Protection Without Coatings

It is a powder-like substance to provide protection under high humidity conditions against rust without coating, to reduce the cost of packaging metal parts and protect them during storage and shipment. Known as VPI, it is a volatile amine nitrate and has been marketed by the Shell Oil Company, New York 20.

The formulation can be applied by placing it in a crystal form in a package containing parts to be protected or by dissolving it in a water or alcohol solution and spraying it on the parts. This substance is required in very small quantities and protects by giving off a vapor which is carried to the metal where is condenses to provide a thin film.

High-Voltage D. C. Insulation Tester

A device for performing a type of testing, new in railroad practice, called the Takk high-voltage d.c. insulation test set, has been introduced by the John Hewson Company, 106 Water street, New York 5. The primary purpose of the set is to detect insulation weakness before breakdowns occur and thus prevent failure of high voltage electrical apparatus in service. The test set is being used for dielectric-absorption tests, over-potential tests and specific fault location on motors, generators, transformers, cables, etc.

For dielectric absorption tests full operating voltage for the equipment under test is applied for ten minutes while readings of insulation leakage current are taken every fifteen seconds. A curve may be plotted of the current values against time, any variation of this curve from one test period to another indicating an impairment of the condition of the insulation.

For an over-potential test, the applied voltage is increased steadily to the desired test voltage and held there for one minute. The manufacturer states that excessive leakage current readings normally occur well before the point where breakdown of weak insulation might occur. Apparatus passing this one minute over-potential test may be returned to full operating load without further test for at least one year without undue risk.

The manufacturer also states that when used for specific fault location, the d.c. test is less harmful to insulation than an a.c. test.

The test set shown in the illustration is a 45 kv. multirange unit, with three voltage scales of 0-1.5 kv., 0-15 kv. and 3-45 kv. Three current ranges are also supplied of 0-50, 0-250, and 0-2,500 microamperes. It is operated from a 115-volt, 60-cycle power source. The set measures 15 in. by 22 in. by 34 in., and weighs 130 lb. The direct current is produced by cold cathode diode rectifier tubes, which require no filament warm-up time before impressing full voltage on them. The test set is not damaged when a dead short is encountered in the apparatus under test.

Snap-Around Portable Meter

The Amprobe 300, a new pocket-size voltammeter with nine ranges up to 300 amp. and 600 volts, has been introduced by the Pyramid Instrument Corporation, Lynbrook, N. Y. It is of the snap-around type, which enables the user to measure current instantly without shutting down equipment or making ammeter connections.

The instrument covers nine ranges: 0-6, 0-15, 0-30, 0-60, 0-150, and 0-300 amp. a.c., and 0-150, 0-300, and 0-600 volts a.c. Voltage test leads are equipped with a new retractable safety plug, which automatically insulates itself when removed from the meter. Jaws are completely insulated down into the sockets, protecting against shorts and shocks. Probe jaws are pointed for working in crowded switch and terminal boxes. A no-rim window lights the meter scale to the edges. It is pocket-size and also fitted for belt-mounting.

ESSO COBLAX

"Tailor-made" to railroad specifications

The Sign of QUALITY — Esso — The Symbol of SERVICE

RAILROAD PRODUCTS

SOLD IN: Maine, N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Penna., Del., Md., D. C., Va., W. Va., N. C., S. C., Tenn., Ark., La.

ESSO STANDARD OIL COMPANY — Boston, Mass. — New York, N. Y. — Elizabeth, N. J. — Philadelphia, Pa. — Baltimore, Md. — Richmond, Va. — Charleston, W. Va. — Charlotte, N. C. — Columbia, S. C. Memphis, Tenn. — New Orleans, La.

ESSO COBLAX LUBRICANTS

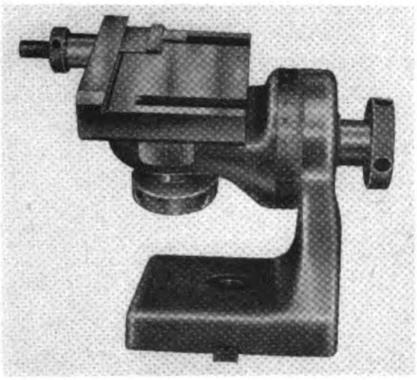
have been specifically developed to provide highly dependable gear lubrication for traction motor drives on electric and diesel-electric locomotives; gas electric and multiple-unit cars; and many other locomotive and car lubrication requirements. Esso COBLAX is available in a wide range from fluid oils to semi-solid products... "tailor-made" for railroad applications.

BACKED BY CONSTANT RESEARCH

— keeping pace with latest engine design and developments. Esso Railroad Products are constantly being tested and improved.

BACKED BY CONSTANT FOLLOW-UP

— on-the-job check ups by Esso Sales Engineers assure dependable performance of Esso Railroad fuels and lubricants! Be sure to call on ESSO for any fuel or lubricating problem.



Chaser Grinding Attachment

This fixture is used to grind the compound rake and lead angles which are essential in the production of accurate, well-formed threads. It can be adapted for utilization of any grinding machine which has a traversing table regardless of the type of grinding wheel.

The base of the device can be clamped to a T-slotted table or in a magnetic chuck. Its platen can be rotated throughout a 360 deg. circle to provide a means of producing the desired lead angle.

Known as the No. 20 Fixture, and introduced by the Landis Machine Company, Waynesboro, Pa., it covers chaser widths from 1¼ to 4⅜. The unit can also be used for chaser widths from ⅞ to 1¼ in. by the addition of a grinding block.

Non-Spattering Machinery Oil

May be used in almost all applications requiring a general-purpose machinery oil. It is of special value for hand-oiled machinery, where the oil tends to drip off the moving parts.

This product is a tacky, mobile fluid, having a viscosity approximately that of SAE-30. It is a mineral oil processed for metal adhesiveness and contains 100% petroleum materials. Known as Kling-Oil, it was developed by Magnus Chemical Company, Garwood, N. J.

The properties of the oil are useful in the lubrication of machines having a multiplicity of moving parts where the retention of lubricant to avoid dripping and spatter is important. Its tackiness remains unchanged in service. No gumming, drying or building up is experienced after continued use.

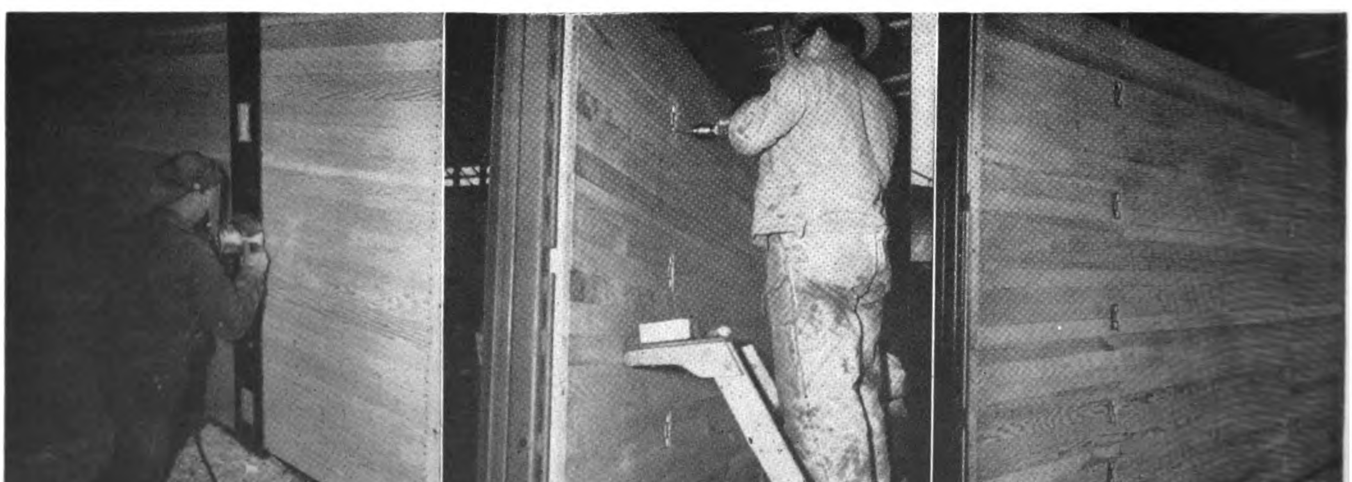
Steel Strap Anchors For New or Old Cars

Steel strap load anchors of a type recently developed and placed on the market by the Keystone Railway Equipment Company, 80 East Jackson boulevard, Chicago 3, are easily installed by car shop workmen with simple equipment and without special skill. They can be applied to any car of standard design, either new or old, as it is not necessary to remove or renew car lining in making the application. No special sections need be used or anything left off or added during the building procedure.

Holes in the side lining the exact size of the anchor are the first requirement and quickly made by a wood router and steel templet. The templet is placed on the side lining in line with the side post and secured with a few nails. All holes in the lining at each post are cut with one templet setting; time required, 12 to 20 sec. per hole. The routers are loaned to railroads applying Keystone load anchors. On the job instruction in use of the router, templet making and anchor application are supplied.

After holes in the lining are cut, the anchors, which are malleable iron castings double coated with a rust inhibitor are driven into a tight taper fit in the side lining with a few hammer blows. The anchor is then securely held in place with blind rivets or welded stud bolts and nuts.

In the car illustrated the Keystone load anchors were applied at alternate side posts, six per post, or a total of 48 anchors per car. By the use of steel strapping applied through these anchors to sectionalize and tie partial loads in place, lading damage is largely prevented and crating and blocking expense minimized.



Left—Use of wood router and steel template in cutting accurate holes for load anchors. Center—Drilling blind rivet holes through steel side-post flange. Right—Load anchors riveted in place flush with inside lining.

Plastic Dot Work Glove

A saving of over 40 per cent to users of canton flannel work gloves has been made possible, according to the manufacturer, by the application of plastic dots perma-

(Continued on page 154)

NEWS

Davidson Retires from Loco. Inspection Bureau

Edward H. Davidson retired on September 30 from the directorship of the Bureau of Locomotive Inspection of the Interstate Commerce Commission after 38 years of service with the bureau. He plans to enter consulting work at Washington, D. C., where he is a licensed mechanical engineer.

The bureau directorship is a position filled by Presidential appointment with confirmation by the Senate. With the retirement of Mr. Davidson, the commission designated one of the two assistant directors, Allyn C. Breed, as acting director.

Mr. Davidson had been director since June 1949, when his appointment by President Truman was unanimously confirmed

Edward H. Davidson

by the Senate. His retirement was pursuant to Civil Service retirement rules, as he became 70 years of age on September 26.

Mr. Davidson was born at Monroe, Conn., and his family later moved to Baraboo, Wis., where he attended public schools. His first employment was with the Chicago & North Western as an engine wiper and apprentice. He was subsequently employed by the Baltimore & Ohio as a machinist, and by the Central of New Jersey in various capacities, including those of machinist, engineman, and enginehouse foreman.

Mr. Davidson then left railroad service to become master mechanic for Milliken Bros. Steel Corporation. He came back as a locomotive engineer on the Southern. Next, he spent several years in Panama, where he was employed by the Panama Canal Commission's Transportation Department.

It was on October 23, 1914, that Mr. Davidson joined the staff of the Bureau of Locomotive Inspection as district inspector. He continued in that capacity until May 1940, when he became assistant chief inspector by appointment of the late President Roosevelt. The title of assistant chief inspector was subsequently changed to assistant director, and Mr. Davidson remained in that position until his appointment to the directorship. He is a member of the American Society of Mechanical Engineers, Master Boilermakers Association, Locomotive Maintenance Officers' Association, and Brotherhood of Locomotive Engineers.

A.S.M.E. Annual Meeting

This year's annual meeting of the American Society of Mechanical Engineers will be held at the Hotels Sheraton and McAlpin, November 30 to December 5, inclusive. Those sessions during the annual meeting program of particular interest to railroad men are shown below.

In conjunction with the annual meeting, the twentieth National Power Show, an exposition of power and mechanical engineer-

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

Freight Service (Data from I.C.C. M-211 and M-240)

Item No.		Month of June 1952	Month of June 1951	6 months ended with June 1952	6 months ended with June 1951
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	14,705	23,574	107,147	157,845
3-06	Total, Diesel-electric	26,449	22,744	158,862	128,599
3-07	Total, electric	697	836	4,654	4,962
3-04	Total, locomotive-miles	41,890	47,155	270,768	291,426
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,502	1,706	9,763	10,336
4-06	Empty, total	860	871	5,360	5,168
6	Gross ton-miles-car, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	24,528	42,232	191,067	271,795
6-02	Total in oil-burning steam locomotive trains	8,161	11,960	49,094	73,289
6-03	Total in Diesel-electric locomotive trains	71,517	63,840	439,319	359,693
6-04	Total in electric locomotive trains	1,925	2,298	12,967	13,627
6-06	Total in all trains	106,275	120,337	692,892	718,499
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.03	1.04	1.04	1.05
10-02	Loaded freight car-miles	39.00	40.10	39.50	39.40
10-03	Empty freight car-miles	22.40	20.50	21.70	19.70
10-04	Total freight car-miles (excluding caboose)	61.40	60.60	61.20	59.10
10-05	Gross ton-miles (excluding locomotive and tender)	2,763	2,827	2,806	2,739
10-06	Net ton-miles	1,229	1,331	1,291	1,282
12	Net ton-miles per loaded car-mile (M-211)	31.50	33.20	32.70	32.50
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	63.60	66.20	64.60	66.70
14	Averages per train hour (M-211):				
14-01	Train miles	17.90	17.10	17.60	16.90
14-02	Gross ton-miles (excluding locomotive and tender)	48,804	47,773	48,811	45,775
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	42.60	46.00	44.80	46.10
14-02	All	40.40	43.80	42.60	44.00
15	Average net ton-miles per freight car-day (M-240)	810	963	899	953
17	Per cent of home cars of total freight cars on the line (M-240)	47.70	39.20	43.60	36.60

Passenger Service (Data from I.C.C. M-213)

Item No.		Month of June 1952	Month of June 1951	6 months ended with June 1952	6 months ended with June 1951
3	Road motive-power miles (000):				
3-05	Steam	6,391	9,601	44,036	64,126
3-06	Diesel-electric	18,890	16,279	109,145	94,835
3-07	Electric	1,581	1,613	9,803	9,697
3-04	Total	26,662	27,493	162,989	168,658
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	268,803	269,456	1,622,687	1,630,372
4-09	Total in coal-burning steam locomotive trains	31,414	49,409	229,745	336,856
4-10	Total in oil-burning steam locomotive trains	25,912	33,232	156,142	199,615
4-11	Total in Diesel-electric locomotive trains	194,124	169,813	1,127,894	990,609
12	Total car-miles per train-miles	9.85	9.61	9.76	9.51

Yard Service (Data from I.C.C. M-215)

Item No.		Month of June 1952	Month of June 1951	6 months ended with June 1952	6 months ended with June 1951
1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	621	1,132	5,166	7,657
1-02	Steam, oil-burning	161	229	1,007	1,460
1-03	Diesel-electric[1]	2,839	2,904	18,629	17,334
1-06	Total	3,643	4,290	24,942	26,607
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	24	43	182	302
2-02	Steam, oil-burning	10	12	68	78
2-03	Diesel-electric[1]	251	240	1,531	1,436
2-06	Total	317	328	1,981	2,017
3	Hours per yard locomotive-day:				
3-01	Steam	5.80	7.40	7.00	8.00
3-02	Diesel-electric	14.90	17.10	16.40	17.50
3-05	Serviceable	13.10	14.10	14.30	14.50
3-06	All locomotives (serviceable, unserviceable and stored)	11.20	12.20	12.40	12.50
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.69	1.74	1.77	1.77
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.73	0.76	0.76	0.77

[1] Excludes B and trailing A units.

Bending Sheet Metal and Steel Plate

Single Pieces or Quantity Runs

Boxes, cabinets, channels, angles, etc. are made in railroad shop in record time.

One of two pieces of rectangular-to-round transition, 11 partial bends are made on each corner. Time per piece, approximately 7 minutes.

These two typical installations in railroad shops show the versatility of the CHICAGO Power Bending Brake for bending sheet metal and steel plate. Single and any number of duplicate pieces can be formed in record time without the use of dies. And only a few minor adjustments are required to change from one job to another. The ease, speed, and safety of operation make the CHICAGO Power Bending Brake an economical method for handling a large variety of bending work.

Investigate the many possibilities of the CHICAGO Power Bending Brake. Many standard models offer a choice of capacity up to 14-foot length of bend in ¾-inch plate.

For complete story of the CHICAGO Bending Brake with performance data on a variety of bending, ask for Bulletin P-51.

DREIS & KRUMP MANUFACTURING COMPANY
7414 S. Loomis Blvd., Chicago 36, Ill.

CHICAGO STEEL BENDING BRAKES, BOX and PAN BRAKES, PRESS BRAKES

Order EX-CELL-O Pins and Bushings *From Stock!*

FOR LOCOMOTIVES, PASSENGER AND FREIGHT CARS

If your railroad pins and bushings are among Ex-Cell-O's wide range of standard sizes, you can save money and expedite delivery by ordering directly from stock. You'll get highest quality materials and workmanship, as evidenced by the fact that more than 200 railroads and equipment builders depend on Ex-Cell-O for hardened and ground steel pins and bushings. Order them directly from the convenient Ex-Cell-O Catalog.

Unless your copy of the Ex-Cell-O Catalog of pins and bushings is in plain sight on top of your desk, better send for another copy today! Ask for Bulletin 32381.

XLO

RAILROAD DIVISION
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

52-18

ing equipment, will be held at the Grand Central Palace, New York, December 1 to 6, inclusive.

MONDAY, DECEMBER 1

2:30 P.M.

Gas Turbine Power (II)—Fuels (II)—Power (II)

Residual Fuel-Oil Ash Corrosion, by B. O. Buckland, C. M. Gardiner, and D. G. Sanders, General Electric Co.

The Use of Residual Fuel Oils in Gas Turbines, by Philip Draper, Shell Petroleum Co.

TUESDAY, DECEMBER 2

9:30 A.M.

Fuels (IV)—Power (IV)

Combustion of Pulverized Coal in Water-Cooled Radiant Tubes, by R. A. Herman, Battelle Memorial Institute; T. R. Sawyer, Steam Locomotive Research Institute, and G. E. Keinath, Battelle Memorial Institute

The Development of a Vaporizing Oil Burner, by J. A. Johnson and E. H. Eustis, Thermal Research & Engineering Corp.

Pulverized - Coal Gasification—Ruhrgas Processes, by Kurt Traenckner, Essen, Germany

2:30 P.M.

Oil and Gas Power (I)—Railroad (I)

Crankcase Explosions, by Experimental Department, Fairbanks, Morse & Co.

Combustion of a Low-Volatility Fuel in a Turbo-Jet Combustion Chamber-Effects of Fuel Vaporization, by Phil Myers, University of Wisconsin

GAS TURBINE POWER (IV)

Temperature and Gas-Analysis Surveys in the Combustion Zone of Gas-Fired Gas-Turbine Combustors, by R. L. Riehe, Westinghouse Research Laboratory

Fuel-Spray Examination Methods, by F. C. Engel, Westinghouse Research Laboratory

Industrial-Type Oil- and Gas-Fired Combustion Chambers, by Samuel Letvin, Thermo Products, Inc.

WEDNESDAY, DECEMBER 3

12:15 P.M.

Fuels Division Luncheon. Subject: Fuels in a Technical Economy, by Frederic O. Hess, president, Selas Corporation of America.

2:30 P.M.

Oil and Gas Power (IV)—Railroad (III)—Lubrication (I)—A.S.T.M.

Diesel Maintenance Control by Spectrographic Means, by Harold R. Sennstrom, American Locomotive Co.

Diesel Lubrication—Oil Performance as Related to the Electron Microscope, by Ray McBrian, Denver & Rio Grande western.

7:30 P.M.

Annual banquet.

THURSDAY, DECEMBER 4

9:30 P.M.

Railroad (IV)

Survey-Progress in Railway Mechanical Engineering, 1951-52, by T. F. Perkinson, General Electric Co.

A Method for Determining Stresses and Vibration Data in Brake Beams Under

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE OCTOBER ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horse-power*	*Service*	*Builder*
Alaska	6[1]	1,500		Electro-Motive
Canadian Pacific	10A[2]	1,500	Road	General Motors Diesel Ltd.
	4B[2]	1,500	Freight	General Motors Diesel Ltd.
	14[2]	1,500	Road Switchers	General Motors Diesel Ltd.
	6[2]	1,200	Switchers	General Motors Diesel Ltd.
	2A[2]	1,600	Road	Montreal Loco. Wks.
	10A[2]	1,600	Freight	Montreal Loco. Wks.
	2B[2]	1,600	Road	Montreal Loco. Wks.
	6B[2]	1,600	Freight	Montreal Loco. Wks.
	4[2]	1,000	Switch	Montreal Loco. Wks.
	5[2]	660	Switch	Montreal Loco. Wks.
	6A[2]	1,600	Freight	Canadian Loco. Co..
	4B[2]	1,600	Freight	Canadian Loco. Co.
Central of Georgia	12[3]	1,600	Road switch	Alco-G.E.
	4[3]	1,200	Switchers	Baldwin-Lima-Hamilton
	4[3]	1,200	Switchers	Electro-Motive
	4[3]	1,200	Switchers	Fairbanks, Morse
Delaware, Lackawanna &Western	6	1,600	Road switch	Fairbanks, Morse
Louisville & Nashville	4B[4]	1,500	Road freight	Electro-Motive
	30[4]	1,500	General purpose	Electro-Motive
	2[4]	1,200	Switch	Electro-Motive
	2A[4]	1,600	Road freight	Alco-G.E.
	7[4]	1,600	Road switch	Alco-G.E.
	4[4]	1,000	Switch	Alco-G.E.

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Central of Georgia	25[5]	70-ton covered hopper	Pullman-Standard
Chicago, Burlington & Quincy	1	125-ton flat	Company shops
Duluth, Missabe & Iron Range	500[6]	70-ton ore	Pullman-Standard
International-Great Northern-St. Louis, Brownsville & Mexico	1,000[7]	50-ton box	Company shops
Lehigh Valley	100[8]	70-ton steel cov'd. hop'r	Bethlehem Steel
Merchants Despatch Transportation Corp. and Northern Refrigerator Line	1,000[9]	40-ton refrigerator	M.D.T. shops
Missouri Pacific	1	Flat	Company shops
North American Car Corporation	75	70-ton covered hopper	Pullman-Standard
Reading	1[10]	245-ton flat	Company shops
	1[10]	1250-ton flat	Company shops
St. Louis-San Francisco	1	125-ton flat	Company shops
St. Louis-Southwestern	1	125-ton flat	Company shops
Southern Pacific	1,000[11]	70-ton flat	Company shops
	800	50-ton gondola	Company shops
	100	70-ton gondola	Company shops
	100	50-ton pulpwood	Company shops
Toledo, Peoria & Western	25[12]	50-ton box	Pullman-Standard
	25[12]	50-ton box	American Car & Fdry.
Texas Mexican	30[13]	70-ton gondola	Pullman-Standard
	5	70-ton hopper ballast	Pullman-Standard
Union Tank Car Co.	600	50-ton tank	Company shops

PASSENGER-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Atchison, Topeka & Santa Fe	145[14]	Chair	Budd Co.
	8[14]	Dome-lounge	Budd Co.
	50[14]	Baggage	Budd Co.
	10[14]	Railway post office	Budd Co.
Chicago & Eastern Illionis	10[15]	Coaches	Budd Co.

[1] Delivery Scheduled for completion by December 31.

[2] Deliveries scheduled for summer of 1953.

[3] Deliveries scheduled to begin late in November and completed by February. When all units are received, the road will be completely dieselized. The switchers will have multiple-unit controls.

[4] Deliveries expected to be completed by July 1, 1953.

[5] Estimated cost $3,500,000.

[6] In addition to 25 reported in the October issue. Estimated cost of the 50 cars, $362,769.

[7] These single door-steel cars will cost over $6,200,000. Construction to begin before the end of 1952.

[8] Scheduled for delivery in the spring of 1953.

[9] Estimated cost of $9,549 each, subject to interim escalation. Delivery scheduled to begin in September 1953 to be completed in December 1953.

[10] Larger cars to cost $36,500; smaller car, $26,944.

[11] The 70-ton gondolas and the pulpwood flat cars are for service on the Texas & New Orleans.

[12] Delivery of the cars, which will cost approximately $300,000, is expected during the first quarter of 1953

[13] For delivery in the second quarter of 1953. Cost of gondola cars, $199,500; of ballast cars, $39,335

[14] The chair cars will seat 48-passengers, and the full-length dome-lounge cars 76 passengers each in the upper section. Delivery of the cars is expected to begin in the fall of 1953.

[15] Scheduled for delivery in fall of 1953.

Notes:

Atchison, Topeka & Santa Fe.—The Santa Fe has received approval from its board of directors to build 500 hopper cars, 500 gondola cars and 250 covered hopper cars in the road's own shops.

Northern Pacific—Orders for new passenger equipment—including 10 dome coaches, six dome sleeping cars, two dining cars, four sleeping cars and two coaches—will soon be placed by the Northern Pacific.

Actual Operating Conditions, by R. B. Cottrell, American Steel Foundries.

2:30 P.M.

Railroad (V)—Gas-Turbine Power (VIII) —A.I.E.E.

Gas-Turbine Electric Locomotives on the Union Pacific, by A. H. Morey, General Electric Co., and F. Fahland, research and standards engineer, Union Pacific.

Operation of Westinghouse-Baldwin Gas-Turbine Locomotive, by T. L. Weybrew, C. Kerr, Jr., and T.. J. Putz, Westinghouse Electric Corp.

Correction Notice

IN the illustration at the bottom of page 89 of the September Railway Mechanical & Electrical Engineer, the truck shown on the repair stand at the right is an EMD diesel freight unit truck and not an Alco truck as might be implied from the title of the article.

June 1953 Program of Mech. Div. Announced

THE 1953 annual meeting of the Mechanical Division, Association of American Railroads, will be held June 22-26, inclusive, at Atlantic City, N. J., where the Pan American Railway Congress will also be in session from June 21 to 25, its earlier sessions, June 12-19, being scheduled at Washington, D. C. The Purchases and Stores Division will also hold sessions on June 22-26, and there will be an A.A.R. member road meeting during the week. For the benefit of those attending all these meetings, there will be an exhibit under the auspices of the Railway Supply Manufacturers Association.

The meeting will open on Monday, June 22, at 9:30 a.m. Daylight Saving Time, with a joint session of the Mechanical and Purchases and Stores Divisions. No afternoon sessions are scheduled. C. W. F. Coffin, president of the Railway Supply Manufacturers Association, will call the meeting to order. Following addresses by Mayor Joseph Altman of Atlantic City and William T. Faricy, president, A.A.R., the Mechanical Division will convene in Meeting Room "B." H. T. Cover, assistant vice-president (operating) and chief of motive power, Pennsylvania Railroad, will preside. The Division will then proceed with the following program.

MONDAY, JUNE 22

Address by J. M. Symes, executive vice-president, Pennsylvania.

Address by J. H. Aydelott, vice-president, Operations and Maintenance Department, A.A.R.

Address by Chairman H. T. Cover.

Action on Minutes of 1952 meeting.

Appointment of Committees on Subjects, Resolutions, etc.

Unfinished business.

New business.

Report of General Committee.

Report of Nominating Committee.

TUESDAY, JUNE 23
9:00 A.M.

Address by W. J. Patterson, Member, Interstate Commerce Commission.

Discussion of reports on:
- Arbitration.
- Prices for Labor and Materials.
- Loading Rules.
- Forest Products Loading.
- Tank Cars.
- Geared Hand Brakes.

WEDNESDAY, JUNE 24
9:00 A.M.

Address by William White, president, New York Central System.

Discussion of reports on:
- Car Construction.
- Passenger Car Specifications.
- Brakes and Brake Equipment.
- Couplers and Draft Gears.

THURSDAY, JUNE 25
9:00 A.M.

Address by V. N. Dawson, general store keeper, Baltimore & Ohio.

Distribution and collection of ballots for members of General and Nominating Committees.

Discussion of reports on:
- Specifications for materials.
- Safety Appliances.
- Wheels.
- Lubrication of Cars and Locomotives.

FRIDAY, JUNE 26
9:00 A.M.

Discussion of reports on:
- Axle and Crank-Pin Research.
- Locomotive Construction:
  - Steam and Electric Section.
  - Diesel Section.
  - Gas-Turbine-Locomotive Section.

Report of Tellers.

Report of Committee on Resolutions.

SATURDAY, JUNE 27

Inspection of exhibits.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (total)	Cars set off between division terminals account hot boxes			Miles per hot box car set off between division terminals
		System	Foreign	Total	
July, 1950	2,745,932,894	...	.....	23,957	114,619
August, 1950	2,937,455,020	7,422	15,490	22,912	128,206
September, 1950	2,974,297,739	6,541	12,881	19,422	153,141
October, 1950	3,165,997,915	4,343	8,935	13,278	238,439
November, 1950	2,868,871,913	2,536	5,331	7,867	364,672
December, 1950	2,813,042,212	2,278	5,968	8,246	341,140
January, 1951	2,840,847,511	2,870	8,436	11,306	251,269
February, 1951	2,425,226,454	4,528	14,063	18,591	130,452
March, 1951	3,063,173,942	3,667	10,078	13,745	222,857
April, 1951	2,996,562,763	3,702	8,914	12,616	237,521
May, 1951	3,013,634,782	5,631	13,737	19,368	155,599
June, 1951	2,874,873,495	7,074	15,376	22,450	128,057
July, 1951	2,768,920,095	8,886	18,823	27,709	99,929
August, 1951	3,009,371,111	9,023	19,092	28,115	107,038
September, 1951	2,925,570,545	6,472	13,565	20,037	146,008
October, 1951	3,116,490,095	4,131	9,053	13,184	236,384
November, 1951	2,939,503,144	2,022	4,405	6,427	457,368
December, 1951	2,752,316,133	2,130	5,398	7,528	365,611
January, 1952	2,824,298,630	3,208	7,197	10,405	271,437
February, 1952	2,809,162,671	2,723	6,473	9,196	305,477
March, 1952	2,943,812,727	2,594	5,877	8,471	347,517
April, 1952	2,766,313,714	3,826	7,759	11,585	238,784
May, 1952	2,918,508,445	6,020	10,938	16,958	172,102
June, 1952	2,672,512,889	8,466	14,495	22,961	116,394

AB Brake Deadlines Set For Non-Interchange Cars

NON-INTERCHANGE cars (including cabooses) that may be used in transporting revenue freight must all be equipped with AB brakes by December 31, 1953, and all other non-interchange cars must be equipped by December 31, 1954.

These deadlines were set by the Interstate Commerce Commission in a September 24 order by Commissioner Patterson. The order, issued in the No. 13528 proceeding, was based on the record of a public hearing held September 15 at Chicago.

On September 25, one day after the above order was entered, Division 3 of the commission entered another in the case. It modified the proceeding's basic order by adding a stipulation which said installation of AB brakes would not be required "on cars that are used exclusively in switching operations and are not used in train movements within the meaning of the Safety Appliance Acts."

Dr. Buchi Receives Henderson Medal

DR. Alford J. Buchi of Winterthur, Switzerland, received the George R. Henderson Medal of the Franklin Institute at the Institute's Medal Day ceremonies on October 15. The citation accompanying the medal reads as follows: "In view of his contributions in augmenting the capacity and performance of the four-cycle diesel engine through his turbocharging system, in all classes of service, but particularly in the railway field."

The system developed by Dr. Buchi was primarily designed for the four-cycle engine. In the invention is the introduction of the multiple exhaust pipe arrangement, a feature which contributed materially to the success of supercharging the diesel engine. The system has had extended application in the stationary, marine and locomotive fields. In the latter field alone in this country the application of Buchi-turbocharged engines amounts to practically 8.5 million horsepower, or about 7,000 diesel locomotives

of all kinds (passenger, freight and switching locomotives).

From 1909 to 1918 Dr. Buchi was chief of the research department for diesel engines in the Sulzer Brothers' plant at Winterthur. From 1918 to 1919 he was chief engineer in charge of marine diesel engines at Howaldtswerke in Kiel, Germany, and from 1919 to 1927 was chief engineer in the diesel engine department of Sulzer Brothers. In the latter year he began the organization of the Buchi Syndicate for the development of the turbocharging system. From 1928 to 1935 he was managing director of the Swiss Locomotive and Machine Works at Winterthur, and since then has acted as head of the Buchi System.

In 1937 Dr. Buchi received the Melville Award of the American Society of Mechanical Engineers for his paper on Supercharging of Internal-Combustion Engines with Blowers Driven by Exhaust Gas Engines.

Chicago Car Foremen Elect New Officers

At its annual meeting, October 10, in Chicago, the Car Foremen's Association of Chicago elected the following officers for the ensuing year: President, J. F. Monger, shop superintendent, Illinois Central; first vice-president, H. A. Harris, master car builder, Gulf, Mobile & Ohio; second vice-president, H. L. Hewing, superintendent, Chicago Car Interchange Bureau; secretary-treasurer, W. R. McCain, mechanical assistant, Mather Stock Car Company.

SUPPLY TRADE NOTES

Van der Horst Corporation.—*William J. Fritton*, formerly assistant to president, has been elected vice-president and sales manager of the Van der Horst Corporation, with headquarters at Olean, N. Y.

◆

Cummins Engine Company.—*C. R. Boll, Jr.*, has been appointed general sales manager at Columbus, Ind. Mr. Boll, who was previously manager—engine sales, will be responsible for engine, parts and contract sales, the company's regional organization, advertising and sales development. *C. B. Foster* has been appointed to the newly created position of sales manager—engines at Columbus. Mr. Foster will continue in charge of all government contract work and, in addition, will take over the duties of the former position of manager—engine sales.

◆

Dearborn Chemical Company.—*Theodore B. Manheim*, formerly with Scholler Brothers, Inc., Philadelphia, has joined the sales staff of the Dearborn Chemical Company, Chicago. Mr. Manheim will cover the Philadelphia and Delaware territory, with headquarters in Philadelphia.

◆

Pressed Steel Car Company.—The Pressed Steel Car Company is making arrangements to acquire the *Axelson Manufacturing Company* of Los Angeles, maker of petroleum-pumping and aircraft equipment, and the *Umpqua Plywood Corporation* of Eugene, Ore., a plywood and lumber company.

◆

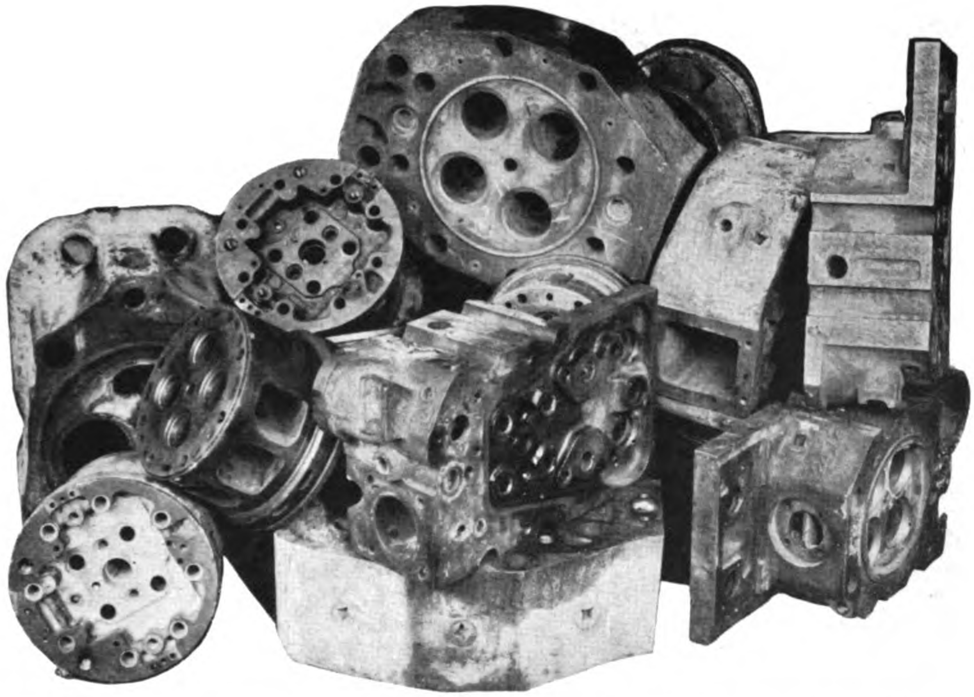
Koppers Company.—*Emmett F. Cary*, formerly district sales manager of the coupling department of Koppers Company, has been appointed district sales manager products division, with headquarters in Pittsburgh. His territory will include western Pennsylvania, West Virginia and part of Ohio.

◆

KSM Products, Inc.—KSM Products, Inc., manufacturer of welding studs and stud welding equipment, has moved to a new, larger plant near Merchantville, N. J.

◆

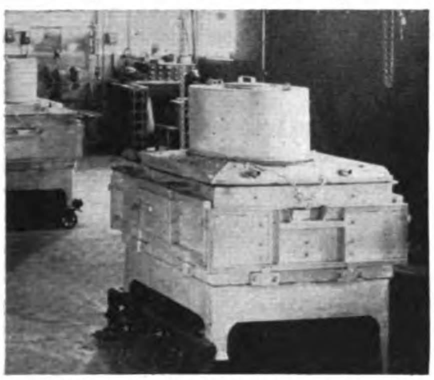
Reliance Electric & Engineering Co.—*William F. Kiser, Jr.*, and *Robert T. Jennings* have been appointed sales application engineers for the Reliance Electric & Engineering Co., in the Philadelphia and Detroit district sales offices, respectively. *John M.*



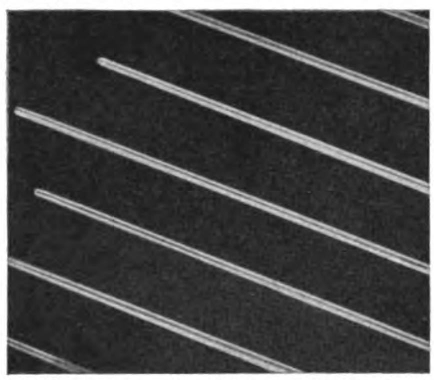
WHEN CRACKED DIESEL CYLINDER HEADS COME IN FOR REPAIRS

Ordinary processes can't do the job!

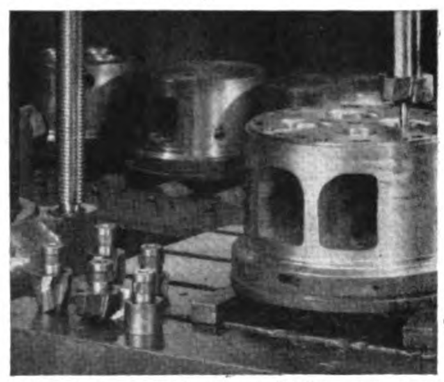
Here's why: *It takes special equipment, materials and experience to rebuild them like new.* Otherwise they'll be back in the shop in no time. Below you see some of the processes developed by the STARK organization over the past twenty years—processes which have rebuilt more than half a million Diesel heads throughout the country . . . a record unmatched in the industry.



STARK'S specially designed ovens. These preheating and annealing ovens eliminate internal stresses and strains, and assure perfect fusion

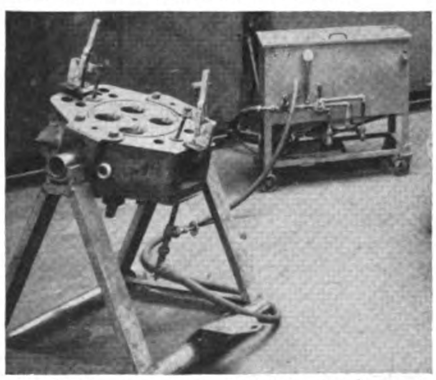


STARK'S exclusive Chrome Nickel Alloy. This alloy for building up valve seats produces cylinder heads having higher tensile strength and Brinnell hardness than new ones.



STARK'S precision machining process. Special carbide-tipped cutters are used to machine built-up valve seats. One of the many precision operations in the STARK process.

STARK'S special grinding equipment. Use of precision equipment assures accuracy to closest tolerances for perfect valve seating. Original specifications restored.



STARK'S pressure testing equipment. All cylinder heads are tested three times, at 100 lbs. hydrostatic pressure. No chance for flaws or cracks to be overlooked.

STARK guarantees equal-to-new efficiency
Send us a trial order of your cracked Diesel heads for rebuilding. If you are not satisfied, there will be no charge. Or write for further details and information about the STARK rebuilding process, and how it can mean large savings in your maintenance costs.

RALPH STARK
INCORPORATED
43-12 THIRTY-THIRD STREET
LONG ISLAND CITY, N.Y.

Duff has been assigned to the applied engineering and industrial sales department, at Cleveland.

◆

ELECTRIC STORAGE BATTERY COMPANY.—*A. G. Sheppard*, an employee of the New York Central at Cleveland, has received the $50 U. S. Savings Bond set aside by the Electric Storage Battery Company at its exhibit at the recent meeting of the A.A.R. Electrical Section at Chicago for the person guessing most closely the number of times the Exide battery on display would propel itself around the track before becoming discharged. The actual number of times was 7,888; Mr. Sheppard's guess, 7,890.

GENERAL ELECTRIC COMPANY.—The General Electric Company has begun construction of a $1,600,000 service shop at Erie Avenue and I street, Philadelphia. The new one-floor structure will encompass 130,000 sq. ft. of floor space, and is scheduled to go into operation in May 1953. It will be G. E.'s largest and best equipped service facility, capable of handling transportation, utility and industrial apparatus. The area it will service includes southern New Jersey, eastern Pennsylvania and Delaware.

◆

JOSEPH T. RYERSON & SON.—*William O. Springer* has been appointed manager of the Ryerson New York plant. Mr. Springer formerly managed the firm's Cleveland plant. *James M. Mead*, whom Mr. Springer replaces at New York, is moving to the executive offices at Chicago for special administrative duties. *John W. Queen*, formerly alloy steel division manager at Chicago, has succeeded Mr. Springer at Cleveland.

◆

BOWSER INC.—*Frankline Fickett*, formerly sales representative of locomotive replacement parts for the Hunt-Spiller Manufacturing Company of Boston, has been appointed manager of the railroad sales division of Bowser, Inc.

Mr. Fickett gained his early railroad experience as an apprentice machinist in the mechanical department of the New York, New Haven & Hartford. From September 1942 until August 1946 he served with a United States railroad battalion, spending two years in Iran on maintenance of diesel locomotives. Upon separation from service as a first lieutenant, he joined the railroad division of Fairbanks, Morse & Co. as a service engineer, diesel locomotives.

Franklin Fickett

◆

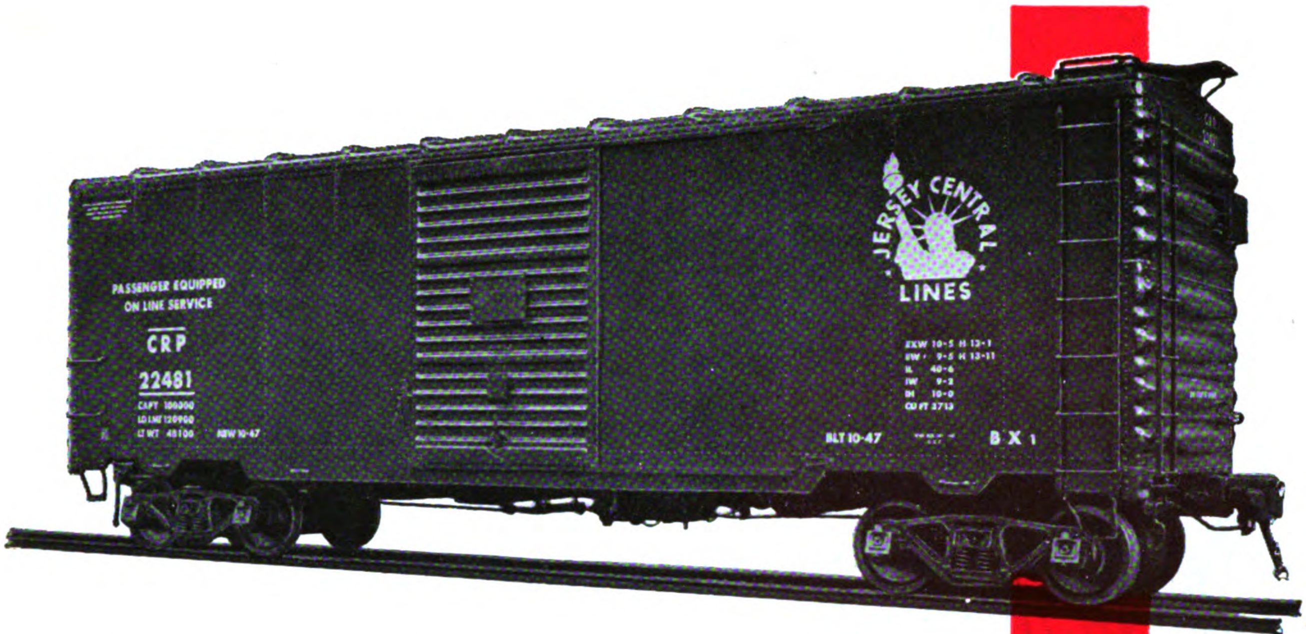
TRUSCON STEEL COMPANY.—*C. B. McGehee* has been made vice-president of the Truscon Steel Company, a subsidiary of the Republic Steel Corporation, Mr. McGehee previously was general manager of sales of Truscon.

◆

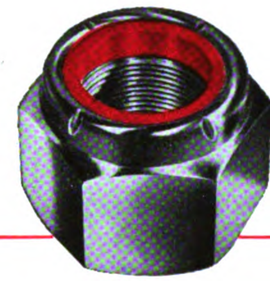
ALUMINUM COMPANY OF AMERICA.—The Aluminum Company of America will construct a large aluminum-smelting project in Alaska as soon as the necessary land can be purchased and required governmental approvals obtained. The project will be in the Taiya Valley district, near Skagway, and will cost approximately $400,000,000. The facilities initially would be capable of producing some 200,000 tons of aluminum annually. From the time of starting, it is thought it will take four years to complete the project and start aluminum production there.

◆

SCHAIFE COMPANY.—*Sheller L. Steinwender* has been appointed to the new position of vice-president—sales of the Schaife Company. His responsibilities will include supervision of all sales activity of pressure vessels for gases, air and liquids—range boilers, liquefied petroleum gas cylinders, diesel



to cut maintenance time Jersey Central specifies* Elastic Stop nuts



(list of freight applications)

Retaining Valve to Bracket

Cenco Pipe Clamps

Running Boards and Brake Steps

Brake Cylinder to Support

AB Valve to Support

Roof Handhold and Lateral Running Board

Brake Regulator to Support

AB Reservoir to Support

Central Railroad of New Jersey has effected important savings in freight car maintenance. By specifying Elastic Stop Nuts on new equipment, they have eliminated much of the costly, time-consuming inspection and retightening required by ordinary nuts.

The red locking collar on each Elastic Stop Nut damps out vibration . . . holds firm under the most severe operating stresses. Inspection requirements are minimized. Elastic Stop Nuts are reusable—there is no need to burn off and replace nut and bolt. Like many other leading roads, Jersey Central has realized the long range maintenance economy that only Elastic Stop Nuts provide.

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starter tanks, armament and others. Mr. Steinwender formerly was general sales manager of the Eastern district for the A. O. Smith Corporation.

◆

Bonney Forge & Tool Works.—*Fred S. Durham, Jr.*, vice-president and secretary of the Bonney Forge & Tool Works, Allentown, Pa., who for the past several years has supervised the company's sales efforts, has assumed additional responsibilities as director of sales. *Harry J. Seaman* has been appointed field supervisor and *E. S. Sensenderfer*, manager of merchandising.

◆

New York Air Brake Company.—*Charles T. Zaoral* has been elected a director and, vice-president in charge of operations; *Lewis K. Sillcox*, has been elected vice-chairman of the board, and *Robert G. Hess*, has been appointed manager of the company's main division at Watertown, N.Y.

Mr. Zaoral has been general manager of the international division of Bendix Aviation Corporation and a director of its subsidiaries in Canada and Australia for the past seven years. Before joining Bendix, he was with General Motors Corporation for 15 years, principally in sales and engineering activities. During World War II he worked for the Electro-Motive Division at La Grange, Ill., where he was in charge of market and sales research on diesel locomotives for United States and foreign railroads. In 1945 he was appointed chief executive officer of Bendix International.

Charles T. Zaoral

Mr. Sillcox began his career in 1903 as a railroad foundry apprentice. From 1918 to 1927 he was general superintendent of motive power of the then Chicago, Milwaukee & St. Paul. In the latter year he became first vice-president of New York Air Brake, and in 1948 he was elected a director and in 1949, executive vice-president.

Lewis K. Sillcox

Robert G. Hess

Mr. Hess began his career with the Westinghouse Electric Corporation. In 1941 he was appointed general superintendent of Hydraulic Controls, Inc., of Chicago, which subsequently became the hydraulic division

of New York Air Brake. Mr. Hess worked in various capacities until he was named head of the company's subsidiary, the Kinney Manufacturing Company, which position he held at the time of his new appointment.

◆

Pullman-Standard Car Manufacturing Company.—A large group of railway officers, railway supply representatives and members of the press were given a personally conducted tour through research and developments facilities of the Pullman-Standard Car Manufacturing Company at Hammond, Ind., on September 12. Led by Director O. C. Maier and members of his staff, the group saw how pre-testing improves basic car design, and glimpsed some of the company's long-range development projects.

Impact tests—in which a box car, carrying a predetermined load, was struck by a fully-loaded hopper car at speeds up to 18 m.p.h., by means of an inclined track—received considerable attention. Forces of the impact and the stresses they set up, acceleration, and other pertinent data were recorded by a dynamometer coupler, strain gages, accelerometers, oscillographs and other modern test equipment as the group watched.

The research model "Train X" coach (page 110, July issue), built for the Chesapeake & Ohio, and recently given extensive road tests was another exhibit that received wide attention. Director Maier and his staff also demonstrated high-speed, submerged-arc welding, a development expected to speed production while improving the quality of welding by reducing shrinkage and residual stresses. Other demonstration exhibits included the testing of freight car floors; static load testing of a passenger car side frame; fatigue tests of a covered hopper car; use of an analog computer to solve problems of car impact; and use of high-speed ("slow motion") motion picture cameras to study action of car parts under dynamic test conditions.

◆

Griffin Wheel Company.—The Griffin Wheel Company, a wholly owned subsidiary of American Steel Foundries, has announced expansion of its pilot plant at Chicago for producing Association of American Railroads X-3 type steel freight-car wheels. The company also plans construction of a car-wheel foundry at St. Hyacinthe, Que., to be known as Griffin Steel Foundries, Ltd., which will likewise produce the new X-3 wheels.

When the pilot plant at Chicago is enlarged, it will have a capacity of about 360 wheels a day. X-3 wheels, which have been approved for freight interchange service in limited quantities, are made of about 0.75 per cent carbon steel melted in an electric furnace and forced into permanent molds. Upon removal from the molds, the wheels are placed in heat-treating furnaces and subsequently cooled so as to remove internal stresses. Temperature and timing of each production step is automatic.

The new Canadian plant, which will be housed in a brick building of modern design, will ultimately have a capacity of 360 X-3 wheels a day, but initial produc-

tion—which is expected to begin in the summer of 1953—will be about half that figure. At present, Canadian roads must import all steel freight car wheels from the U.S. or other countries.

The X-3 steel wheel is being introduced on the 75th anniversary of Griffin's entry into the freight-car wheel manufacturing field.

◆

UNITED STATES STEEL COMPANY.—*Herbert J. Watt* has been appointed assistant vice-president—sales, Western area, and *F. Royal Gammon*, assistant vice-president—sales, Eastern area, of the United States Steel Company.

Mr. Watt, whose headquarters will be in Chicago, was originally employed by the Carnegie Steel Company in 1912. In 1925 he joined the sales department of the Jones & Laughlin Steel Corp. as assistant general manager of sales at New York. He returned to the Carnegie-Illinois Steel Corporation in 1939 and in 1941 was transferred to Chicago as manager of sales for the western area.

Mr. Gammon joined the sales department of Carnegie-Illinois in 1936 as special representative in the New York district sales office. In 1938 he was appointed manager of district sales at Cleveland; in 1942 manager of district sales at New York; and in 1950 manager of sales for the Eastern area. Mr. Gammon's headquarters will continue at New York.

◆

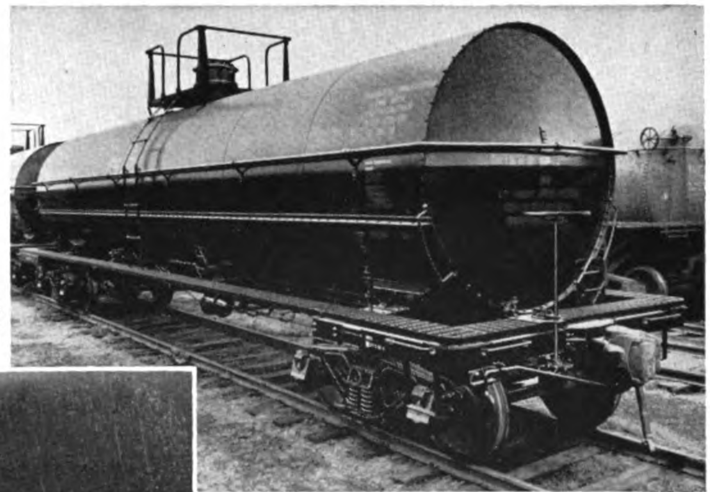
GENERAL MOTORS CORPORATION.—*Danie J. Smilanich*, chief engineer of General Motors Diesel, Ltd., has rejoined the *Electro-Motive Division* at La Grange, Ill. Mr. Smilanich will establish a group to develop designs for locomotive conversions, and repair information for wrecked locomotives.

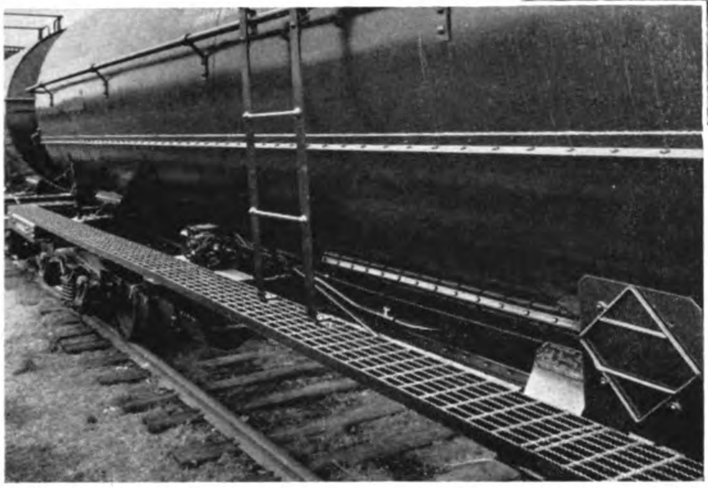
D. J. Smilanich

W. A. Stringer

A. O. Myers

They Walk in SAFETY *with* KERRIGAN *Weldforged* TRADE MARK TANK CAR RUNNING BOARDS

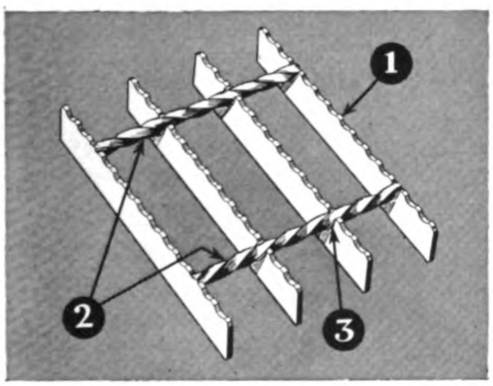




All the Way Around!

Non-Skid, Foot-Sure Safety—safety that is "built-in" Kerrigan grating by the exclusive *Weldforged* process. *Spiraled* all-steel cross-bars (alternating right and left) are fused with sharp-edged serrated bearing bars to form an inseparable *one-piece* grating. By this method weld failure becomes impossible; and yet, even at the point of union, the non-slip spirals of the cross-bars are uninterrupted.

SAMPLES LIKE THIS SHOW IN DETAIL HOW WELDFORGING ACHIEVES UNINTERRUPTED SAFETY:



1. Bearing bars are serrated with clean, sharp edges for the non-slip foundation.
2. Transverse bars, with CONTINUOUS spirals are WELDFORGED into bearing bars with the spirals alternating right and left.
3. Grating is ONE-PIECE unit with uninterrupted spirals even at point of fusion with bearing bars.

KERRIGAN *All Steel* TANK CAR or BOX CAR RUNNING BOARDS and BRAKE STEPS are ALL fabricated to YOUR specifications!

KERRIGAN is the name!

***Weldforged* is the process!**

★ Approved by the Association of American Railroads.

★ Strong ★ Safe ★ Weather-proof

★ Long-lasting ★ Easily installed

Write Now for detailed application drawings and illustrated catalog. Or contact our Engineering Service for complete details for your particular application.

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THE FORGES OF KERRIGAN

KERRIGAN IRON WORKS, INC.

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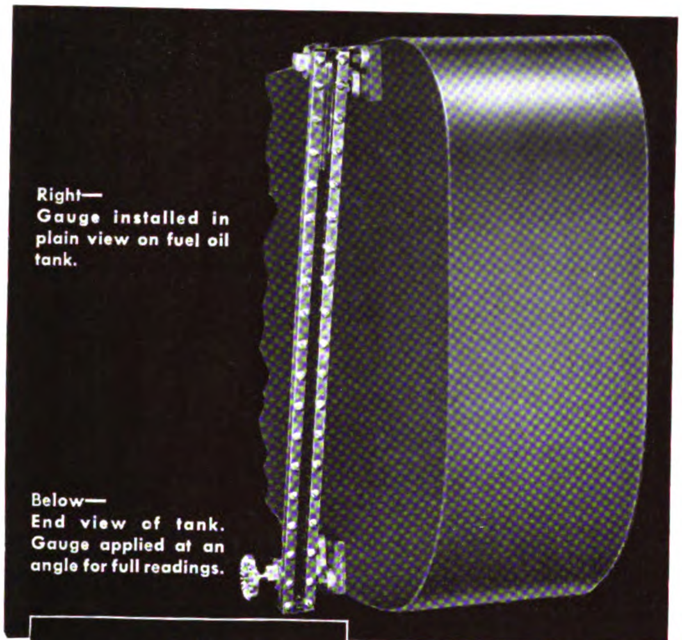
Get Full Readings on Diesel Fuel Tanks

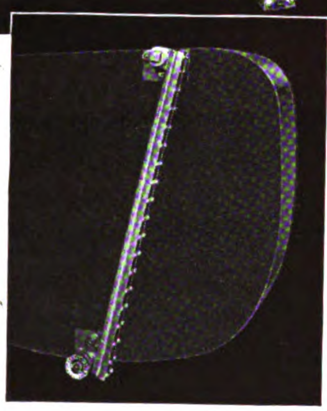
with this New

MAGNUS GAUGE



Right—
Gauge installed in plain view on fuel oil tank.

Below—
End view of tank. Gauge applied at an angle for full readings.



A top-to-bottom gauge, flexible — mountable at any angle, the new Magnus diesel fuel tank gauge gives accurate full readings at all times. With a rigid brass body, the Magnus gauge is substantially built to stay on the job longer . . . not to be disturbed by vibration.

It's easily installed—simply by welding top and bottom plates to tank and drilling two holes. The reflex glass gives you accurate readings at a glance. For quick clean-out, just unscrew top and bottom plugs. Automatic shut-off valve prevents fuel loss in case of breakage.

Write for further information.

MAGNUS BRASS MFG. CO.

Subsidiary of National Lead Co.

525 Reading Road Cincinnati 2, Ohio

For Safety's Sake!

VENTALARM®

WHISTLING TANK FILL SIGNAL

Eliminates Overflow Spillage During Diesel Locomotive Fueling

"JUST FILL 'TIL THE WHISTLE STOPS"

No floats. No wiring.
No electrical connections.

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Over 4,000,000 VENTALARM Signals now in operation on home fuel oil tanks and automotive gasoline tanks.

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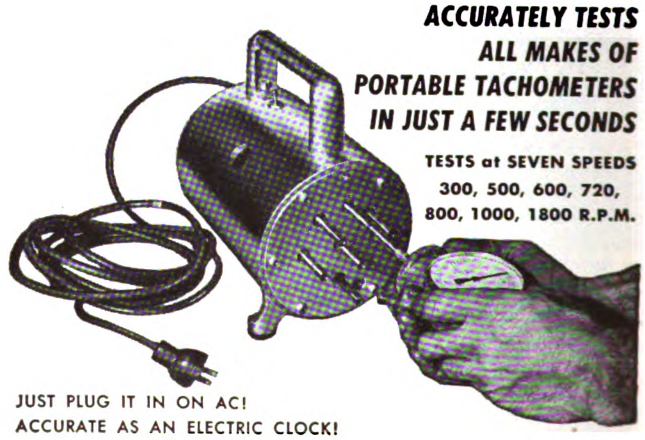
MODEL 1100

TACHOMETER TESTER

ACCURATELY TESTS ALL MAKES OF PORTABLE TACHOMETERS IN JUST A FEW SECONDS

TESTS at SEVEN SPEEDS 300, 500, 600, 720, 800, 1000, 1800 R.P.M.



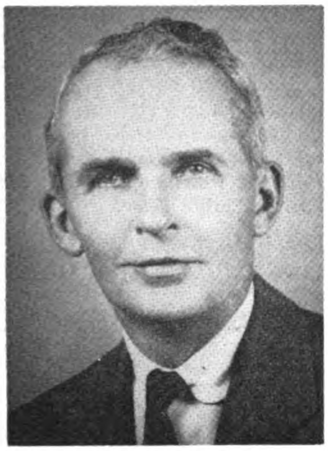
JUST PLUG IT IN ON AC!
ACCURATE AS AN ELECTRIC CLOCK!

Precision-built by the makers of the famous Sweeney POWERENCH Tools

B. K. SWEENEY MFG. CO., Denver 17, Colo. II R5
Please send full information on your Portable Tachometer Tester

Name__________
Address__________
City__________ State__________

W. A. Stringer, has been appointed sales representative, Southeastern region of the Electro-Motive Division at Jacksonville, Fla. Mr. Stringer joined Electro-Motive in 1945 and was sales engineer at the time of his recent appointment. *A. O. Myers* and *B. K. Wingerter*, have been appointed, respectively, regional manager and district sales manager of the Southeastern region at Jacksonville. Mr. Myers formerly was district sales manager at Washington, D.C.; Mr. Wingerter, sales representative in the Southeastern region.



B. K. Wingerter

W. P. Davis

William P. Davis, has been appointed to the newly created position of branch manager of the Robertson, Mo., factory branch of the Electro-Motive. Mr. Davis has been succeeded, in his former capacity of branch plant superintendent, by *John C. Sikes*.

◆

JOSEPH DIXON CRUCIBLE COMPANY.—*R. R. Huntington* has been appointed sales engineer in Louisiana, Mississippi and eastern Texas.

◆

HYSTER COMPANY.—The industrial truck sales and service departments of the eastern division of the Hyster Company have been transferred from Peoria, Ill., to Danville. The new sales offices are housed in a recently completed $40,000 office building, adjacent to the manufacturing plant.

◆

McDOUGALL-BUTLER COMPANY.—Three new representatives have been added to the sales force of this company: *Alex R. Schrei-*

ber has been appointed to cover northeastern and north central New York, with headquarters at Syracuse; *George D. Reno,* to cover Connecticut and Rhode Island, with headquarters at West Hartford, Conn., and *William E. Dennis* in Cleveland and Cincinnati, with headquarters in Cleveland. *Justin A. Shook* was added to the Washington, D.C., staff several months ago.

◆

WATSON-STILLMAN FITTINGS DIVISION.—*Watson-Stillman Company,* Roselle, N. J., has been acquired by the H. K. Porter Company. Operations at Watson-Stillman will continue under direction of *Edwin A. Stillman,* president, The Watson-Stillman fittings division will be operated as a division of H. K. Porter.

◆

HEWITT - ROBINS, INC.—Hewitt - Robins, Inc., has opened new headquarters for the western division at 2533 Malt avenue, Los Angeles, and for the south central division at 5711 Navigation boulevard, Houston, Tex.

◆

INLAND STEEL COMPANY.—*John H. Strome,* formerly assistant to president of the Inland Steel Container Company, a subsidiary of the Inland Steel Company, has been appointed sales manager. *Thomas T. Crowley* has been appointed assistant to president to succeed Mr. Strome.

◆

QUAKER RUBBER CORPORATION.—*M. B. Beline* has been appointed director of national accounts of the Quaker Rubber Corporation, division of the H. K. Porter Company. Mr. Beline, who has been with the Porter Company for several years in the Washington, D. C., office, will coordinate the activities of Quaker's field personnel with the factory, to provide assistance on preliminary engineering, specifications and service.

◆

SKIL CORPORATION.—*Skilsaw, Inc.,* Chicago, has changed its name to Skil Corporation.

PERSONAL MENTION

Bessemer & Lake Erie

M. A. FORTUNE, traveling car inspector at Greenville, Pa., has retired after 43 years of service with the road.

M. R. SEIPLER appointed traveling car inspector at Greenville, Pa.

Canadian National

R. T. WILLIAMS, locomotive foreman at Truro, S. S., appointed assistant superintendent motive power and car equipment, Newfoundland district, with headquarters at St. John's, Newfoundland.

Born at Totting, England.

Career: Entered service of CNR as a machinist apprentice at Moncton, N. B., in March 1924. Became a machinist at St. John's in March 1934; assistant foreman in November 1943; assistant locomotive fore-

(*Continued on page 149*)

man at Halifax, N. S., in December 1944, and locomotive foreman at Truro in July 1946.

R. M. VEENIS, locomotive mechanical engineer at Montreal, appointed mechanical engineer, Central region, with headquarters at Toronto.

Born at Sudbury, Ont.

Education: After war service studied for a mechanical engineering degree at University of Toronto.

Career: Became a machinist apprentice on the CNR in 1938. Appointed superintendent of stationary steam plants at Toronto after graduation; mechanical engineer at Montreal in 1950, and locomotive mechanical engineer for the system early in 1952.

K. W. THOMPSON, mechanical inspector at Montreal, appointed locomotive mechanical engineer at Montreal.

Career: joined CNR at Toronto in 1930. Became a machinist in 1939, after serving as a machinist apprentice at Toronto and Stratford, Ont. Served successfully as inspector of motive power and car equipment at Toronto; assistant foreman in the motive power department at Stratford; and locomotive foreman at London, Ont., until his appointment as mechanical inspector at Montreal in 1951.

Canadian Pacific

JOHN DAVIES, locomotive foreman at Brandon, Man., transferred to position of locomotive foreman at Kenora, Ont.

PERCY CRAWFORD, locomotive foreman at Kenora, Ont., has retired after 47 years' service.

H. W. GILLETT, No. 1 shop foreman at Brandon, Man., appointed locomotive foreman at Brandon.

Chicago & North Western

H. H. MAGILL, superintendent motive power, has had his jurisdiction extended to include all points of the C&NW and a portion of the Western Division of the Chicago, St. Paul, Minneapolis & Omaha from a point south of Sioux City to and including Omaha, the lines between Sioux City and Norfolk and branches to Crofton and Bloomfield.

E. W. GEBHARDT has been appointed superintendent car department, with headquarters at Chicago.

W. P. MILLER has been appointed assistant superintendent motive power—diesels, System Lines, with headquarters at Chicago.

A. T. HITCHCOCK has been appointed superintendent of locomotive operation.

SAM FESUS has been appointed general supervisor, freight and passenger cars, with headquarters at Chicago.

W. H. MCAMIS has been appointed superintendent locomotive and car shops at Chicago Shops.

O. P. JONES has been appointed district master mechanic with jurisdiction over the Galena Division, Southern District of Galen Division, diesel shop at 40th Street, Chicago electrical shop and diesel locomotives operating the Chicago area.

(*Continued on page 152*)

(*Continued from page 149*)

A. M. SCOLARO appointed general foreman (days) at Proviso, Ill.

Erie

WALTER G. COLEMAN appointed assistant of supervisor locomotive operations, with headquarters at Jersey City.

Missouri Pacific

C. R. SMITH, master mechanic, Memphis division, and also master mechanic of the Union Railway of Memphis, has retired after 41 years of service.

C. H. MCAMIS, master mechanic at Monroe, La., appointed master mechanic, Memphis division.

E. M. VANDIVER, master mechanic at Kansas City, Mo., appointed master mechanic, with headquarters at Monroe, La.

A. J. DANIELS appointed master mechanic, with headquarters at Kansas City, Mo.

New York Central

D. D. FERRIS, assistant master mechanic at Harmon, N. Y., appointed terminal foreman at Harmon.

F. E. EDWARDS appointed assistant master mechanic at Harmon, N. Y.

E. L. HYATT appointed master mechanic, with headquarters at Harmon, N. Y.

J. J. WRIGHT appointed master mechanic, with headquarters at Boston.

H. R. MCILVEEN appointed general diesel supervisor—locomotive maintenance.

Norfolk & Western

O. F. HARK, assistant superintendent motive power-personnel has been appointed assistant general superintendent motive power-personnel. The position of assistant superintendent motive power-personnel has been abolished.

C. E. POND, assistant to superintendent motive power has been appointed assistant superintendent motive power-car.

C. S. PATTON, JR., general foreman, locomotive department, Roanoke Shops, has been appointed assistant to superintendent motive power.

R. M. STICKLEY, JR., general foreman—foundry, has been appointed general foreman, locomotive department, Roanoke Shops.

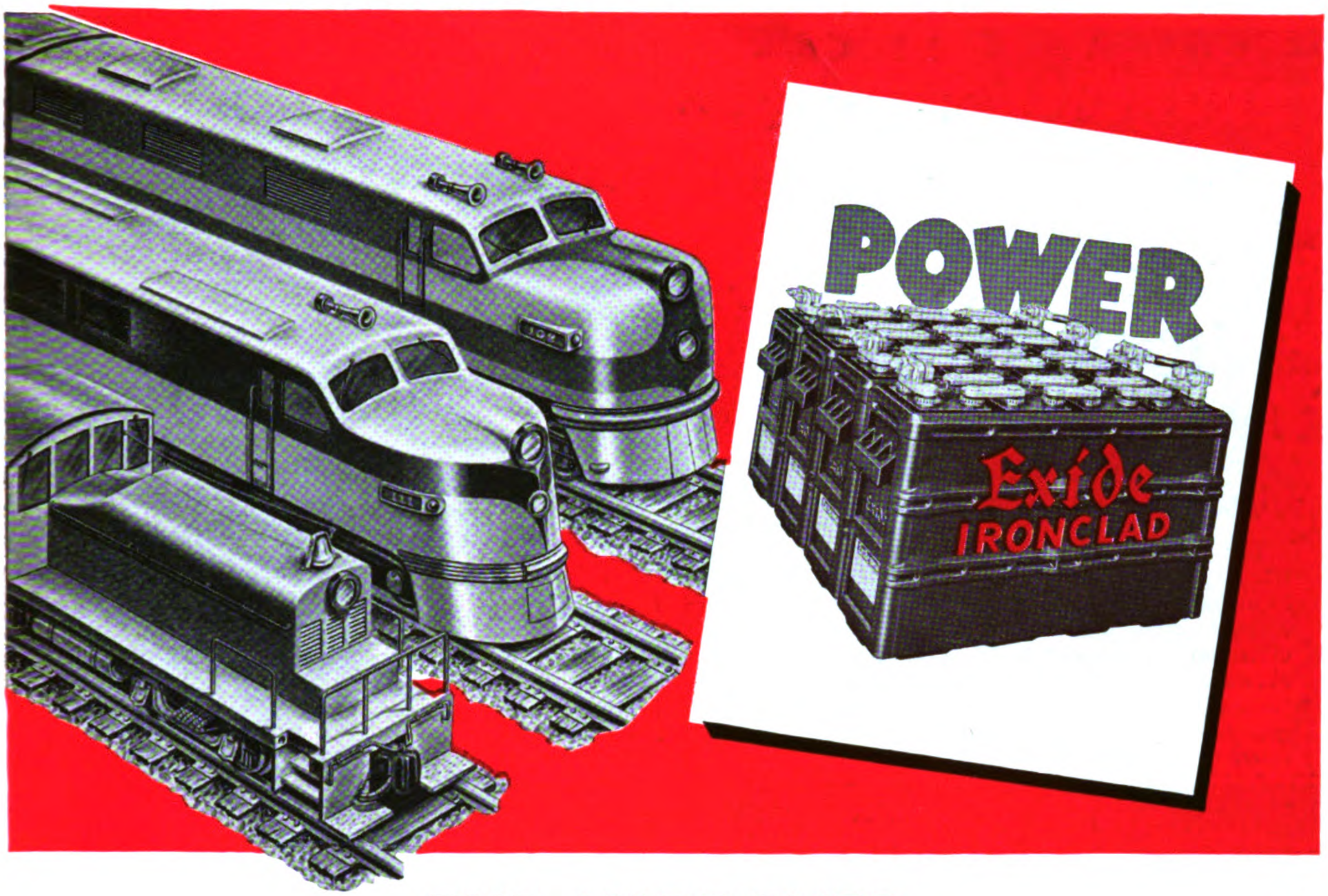
J. A. GEARHART, foreman, machine shop, Roanoke Shops, has been appointed general foreman-foundry.

R. D. STONE has been apointed machine shop foreman at Roanoke. Mr. Stone was formerly assistant machine shop foreman.

E. E. BARTON has been appointed assistant machine shop foreman, Roanoke Shops. Mr. Barton was formerly tool room foreman at that point.

C. R. COLEMAN, foreman—Roanoke wheel shops, succeeds Mr. Barton as tool room foreman.

D. F. KERFOOT, gang leader in the Roanoke wheel shop, has been appointed foreman of the wheel shop.



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Types, sizes and capacities for all makes of diesel locomotives—main line, switching, industrial.

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"EXIDE-IRONCLAD" and "SILVIUM" *Reg. T. M. U. S. Pat. Off.*

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Northern Pacific

Henry G. Burnham, engineer of tests at St. Paul, has retired after 40 years of service.

H. Bruce Hoesly, assistant engineer of tests, appointed engineer of tests at St. Paul.

Southern Pacific

E. J. Carter, office manager in office of general superintendent of motive power at San Francisco, appointed assistant to general superintendent of motive power at San Francisco.

PERSONAL MENTION

Obituaries

E. S. Smith, 84, who retired as master car builder of the Florida East Coast on November 1, 1951, died at St. Augustine, Fla., on September 9.

New Devices

(*Continued from page 128*)

nently set into the 10 oz. flannel. U. S. Testing Co. reports show that the plastic dot fabric outlasts the 10 oz. flannel fabric by well over a 2:1 ratio.

Introduced by Riegel Textile Corporation, New York 17, these gloves cost slightly more than standard types. The new product is said to retain all of the lightness, flexibility and comfort found in regular canton flannel gloves.

◆

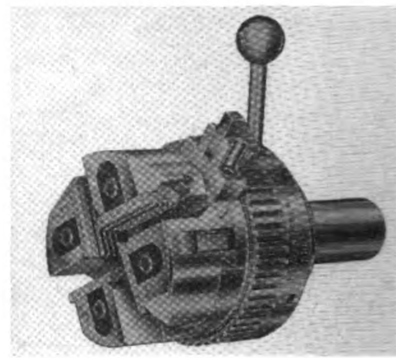
Pressure Instrument Test Gage

Periodic checks of pressure instruments such as controllers, recorders and indicators can, in many instances, save process fluid and otherwise reduce operating costs. Designed for this service is the 6 in. Model P Test Gage, made by The Foxboro Company, Foxboro, Mass.

The device is furnished in ranges of 0-30 in. of mercury up to 0-10,000 lb. per sq. in. pressure and is accurate within 0.5 per cent of the total scale throughout its range. Tapered pipe male thread connections are provided.

Its case is constructed of cast aluminum and the measuring element is either of steel or beryllium copper. The movement consists of a chrome-plated steel pinion, segment and arbor, monel plates and a stainless steel hairspring. Measurement is indicated on an easy-to-read dial.

◆



Self Opening Die Head

A stationary, self-opening die head with a range from No. 4 to ⅝ in. dia. has been designed for application to turret lathes, hand screw machines, and automatic screw machines employing a stationary type head.

Named the 5HH Landmatic Head by its manufacturer, the Landis Machine Company, Waynesboro, Pa., the device contains only a few working parts. A new type size adjustment mechanism has been designed to provide positive locking action.

Opening action is obtained by interrupting the forward travel of the turret slide or carriage. If this pull off opening action is not desired, the head may be opened by hand. Closing is achieved by hand. Chaser holders operate in dove tail slots in the head body.

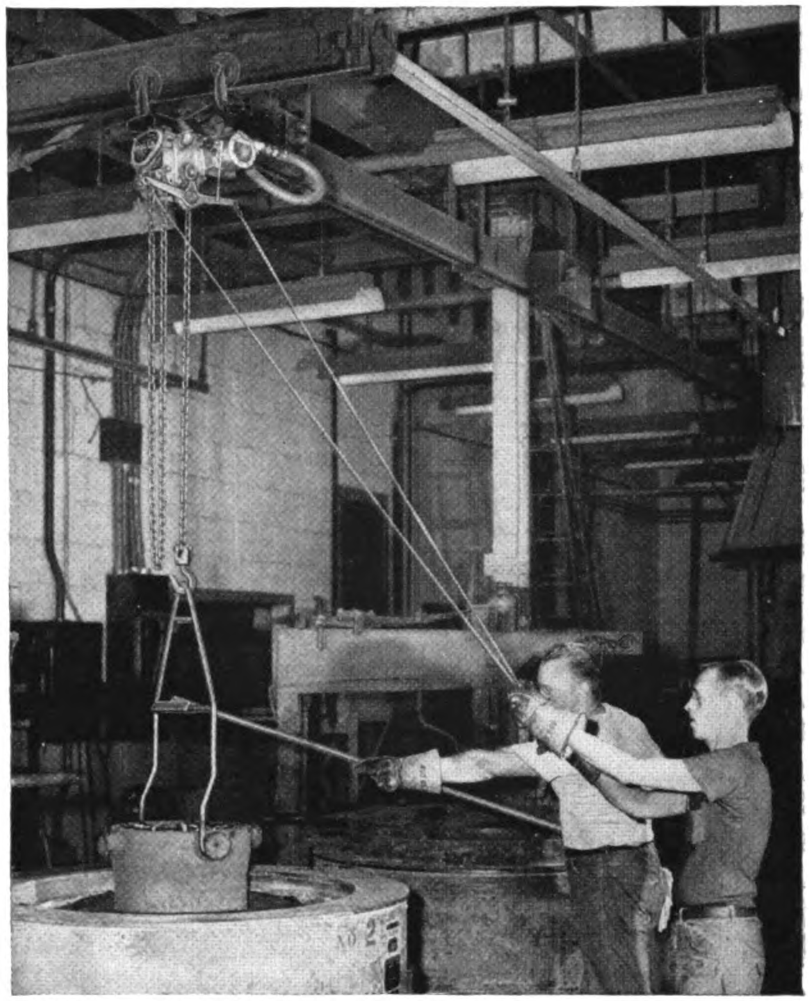
◆

Screw Cover Thermocouple Head

This product is recommended wherever protection against weather and corrosion is required for terminal connections of thermocouples and high speed resistance thermometer bulbs. Typical users of the device developed by the Minneapolis-Honeywell Regulator Company, Brown Instrument Division, Philadelphia 44, include power generator plants and stations, refineries and railroad shops.

Its base is of cast iron, zinc plated and coated with aluminum enamel for protection against attacks from corrosion. The cover is of same material and finish. Slots facilitate assembly with a wrench or screw driver shaft.

The single thermocouple terminal block, which is interchangeable in the head with the duplex thermocouple terminal block



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at 20 feet a minute

. . . or 500 pounds at 42 feet a minute

- This latest CP AIR HOIST — with variable speed, rotary vane air motor — spots loads accurately, quickly; sets them down gently.
- New design, trouble-free throttle valve provides sensitive control from an almost imperceptible creep to full speed.
- Air motor cannot overheat — no shock hazard — no spark hazard — no switches to maintain.
- Self-locking worm gear provides automatic brake — no brake bands to adjust or replace.
- Weighing only 57 pounds, the CP AIR HOIST can readily be carried by millwright to any location.
- Furnished in 300, 500, 700, and 1000 pound capacities.

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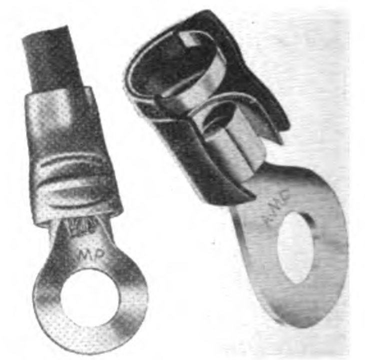
CP Fiftieth ANNIVERSARY

and resistance thermometer terminal block, is molded of heat-resistant refractory material. The block accommodates No. 7 B. & S. gage or smaller wires and No. 12 B. & S. gage or smaller extension wires.

The duplex block accommodates No. 14 B. & S. gage or smaller wires and No. 12 B. & S. gage or smaller extension wires while the resistance thermometer terminal block can take No. 12 B. & S. gage or smaller extension wires.

◆



Solderless Terminal For Control Wiring

A solderless terminal developed especially for intricate control panel wiring has been announced by Aircraft-Marine Products, Inc., 2100 Paxton street, Harrisburg, Pa. Known as the Reinforced Ampli-Bond terminal, it was designed and developed to meet the exacting requirements of control panel wiring. In such work, due to close quarters, the outer plastic covering of a pre-insulated terminal may occasionally be pierced accidentally.

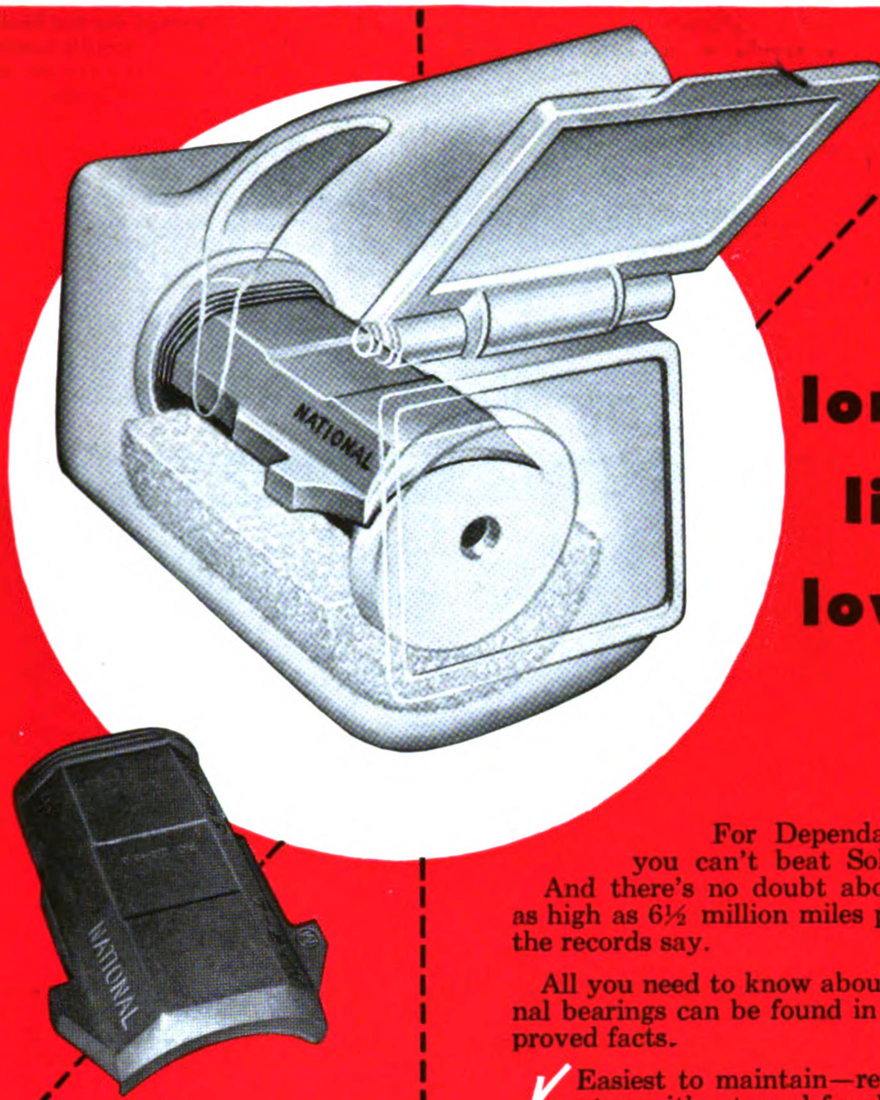
The terminal's design assures that no underlying conducting surface will be exposed even if the insulating sheath is pierced. This is accomplished by means of an insulated metal ring near the base of the insulation support sleeve. The ring gives all necessary strength to combat vibration and sharp bending, but does not communicate with the electrical connection farther up the barrel. It can still be installed completely with one stroke of a tool.

The reinforced terminals are now available in the 12-10 and 16-14 sizes, and in the near future will be available in smaller wire sizes. They are color coded for easy identification, inspection and quality control.

◆

BX Cable with Glass Insulation

An improvement in BX armored cable has been announced by General Electric's Construction Materials Division, Bridgeport 2, Conn. Sizes 14 to 10 A.W.G. of this cable will now utilize a glass braid instead of the customary cotton one. The glass braid, which is inorganic, will not rot and is flameproof. Most important, glass braid makes possible a smaller overall diameter of the cable. Reduction of the size of the



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- ✓ Easiest to maintain—replacement takes minutes, without need for skilled labor.
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- ✓ Most liberal tolerances—axles can be used and reused with simple roller burnishing.
- ✓ Lowest running friction—a single film of oil permits faster acceleration, lower running resistance—particularly at low temperatures
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Behind National Bearing Division's reputation for dependable Journal Bearings lies 75 years of experience, backed by constant engineering research, production ability and extensive foundry facilities.

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steel armor also gives a corresponding reduction in weight which makes the cable easier to handle and carry. The smaller size also means easier pulling through drill holes and improved resistance to impact and crushing.

The new cable fits all standard fittings and is listed by the Underwriters' Laboratories, Inc.

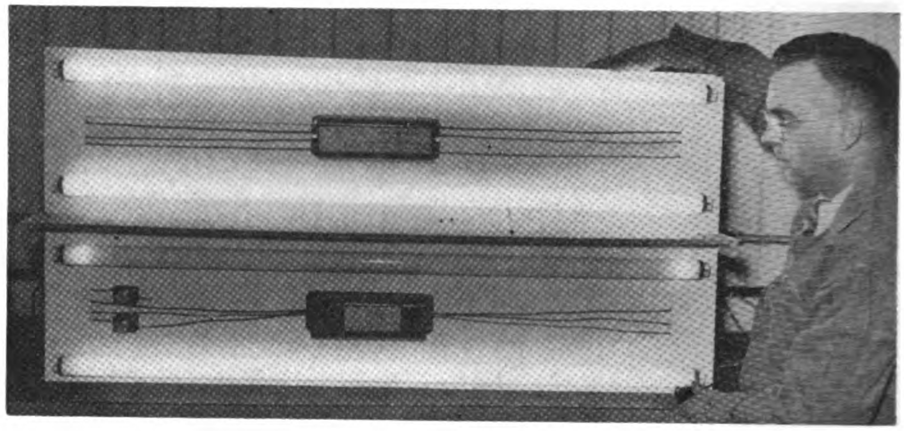
◆

Smooth-Start Fluorescent Lamp

Development of a new type of fluorescent lamp which improves upon the performance of lamps now in general use has been announced by the General Electric Company, Nela Park, Cleveland, Ohio. The new lamps start quickly and smoothly without the aid of external starters.

Named Rapid Start, the lamps are used with especially designed ballasts, and are intended only for new lighting systems. They are being made in the 40-watt size, most popular lamp for general lighting, and in the standard cool white color. Other colors are planned.

In a Rapid-Start lighting system, all lamps controlled by one switch will light promptly,—within about one second after being turned on. The manufacturer states

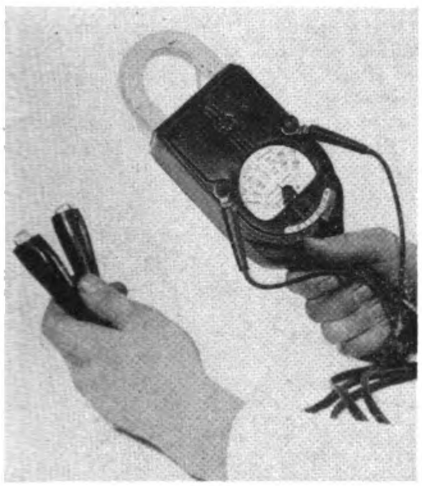


that the lamps will not blink or flicker at any time throughout their lives. The lamps operate in series, two on one ballast.

The lamps differ from conventional preheat fluorescent lamps in two principal respects: they employ a complex, triple-coiled cathode, and a water-repellent coating to insure reliable starting under high humidity conditions.

The illustration shows a comparison of the performance of two of the rapid start fluorescent lamps (top pair), with that of the conventional preheat lamps in general use today. The picture illustrates the comparative speed with which the improved lamps light up. No external starters are required.

◆



Hook-On Volt-Ammeter

A redesigned hook-on volt-ammeter with higher voltage and current ranges and a new pointer-stop mechanism has been announced by the Meter and Instrument Department of the General Electric Company.

Designated type AK-1A, the new instrument will measure alternating current on five scale ranges: 0-7.5, 0-30, 0-75, 0-300 and 0-750 amp. It can be used on both insulated and non-insulated conductors by simply hooking it around the power line. No separate transformers or additional equipment is required.

The instrument will also measure a.c. voltage on three ranges: 0-150, 0-300 and 0-750 volts. To use these ranges, the terminals are connected to the line, and a positive-action selector switch is turned to the desired scale.

The pointer-stop mechanism permits the user to quickly determine peaks in motor starting currents.

A dovetail joint on the instrument's magnetic jaws reduces errors caused by imperfect closing to less than 2 per cent where an ordinary butt joint might cause errors as high as 10 per cent.

The hook-on portion of the AK-1A is a split core transformer with its secondary winding tapped for different ratings and connected to a rectifier instrument through a range-changing selector switch. When the switch is thrown to any voltage-range position, the rectifier is connected to the binding posts through proper internal resistors. Voltage may be measured by connecting leads to the binding posts on the front of the instrument.

The instrument is shielded magnetically. Five hundred amperes in a conductor one foot away from the transformer causes negligible effect on the 300- and 750-amp. ranges, and less than 1 per cent error on 7.5-, 30- and 75-amp. ranges.

◆

Bench Type End-Finishing Machine

Pipe and tube deburring, reaming and facing operations, usually handled on machines such as lathes or by hand filing methods, can now be completed at speeds approaching special machine output, according to Pines Engineering Company, Aurora, Ill.

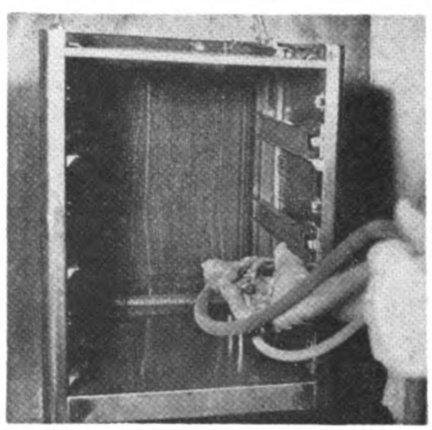
These operations can be performed on their new device, the bench type End-Finishing unit. This product is designed so that changeovers from one job to another can be made in about one minute. Interchangeable chuck inserts and tool holders for different operations are provided.

The machine handles stock up to 2 in. in dia. It is portable and has a three-speed sheave and a ½ hp. motor.

◆

High Solids Sound Deadener

Permits manufacturers of light metal equipment to give their products a solid feeling with sound-hushing ability. The product



has a high solids content and is of fluid consistency that enables it to be applied with a wipe-on tool or spray equipment without fire-proof spray booths and ventilating systems.

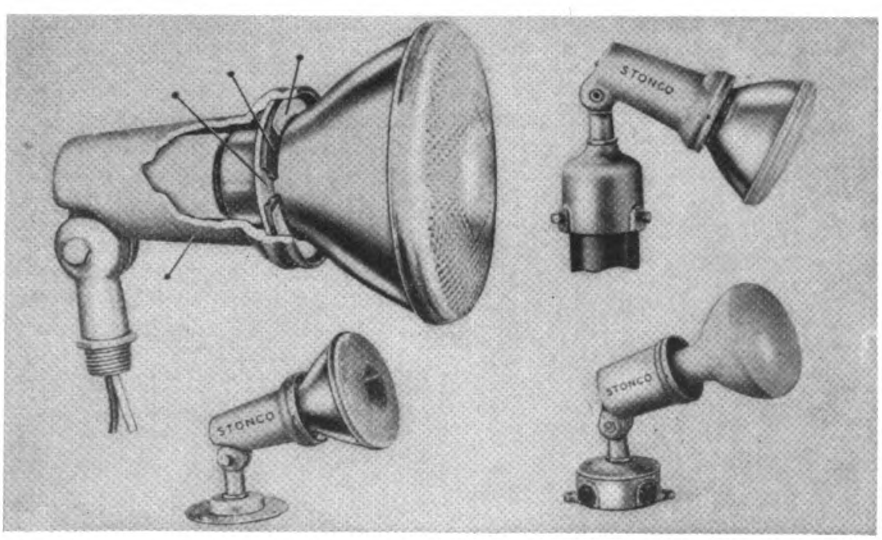
Announced by The Philip Carey Manufacturing Company, Cincinnati 15, the formulation has been named Carey Sound Deadener Nos. 40 and 41. Once dry, it can be protected with emulsion type paint. The product can be baked at temperatures as high as 325 deg. F. without loss of bond, blistering, flow or without streaking through the paint, except the lighter shades.

◆

Weatherproof Mount For Reflector Lamps

A weatherproof lamp holder for reflector type lamps has been developed by Stonco Electric Products Company, Kenilworth, N. J. It is called the Stonco Cushion-Seal Holder and makes use of a high-temperature, silicon rubber cushion-seal that hugs the neck of the lamp in a weatherproof seal, that is said to withstand the highest temperature to which the lamp may be subjected in outdoor service. By sealing the lamp low at its neck, and by exposing its hot spot area to open air cooling, lamps are reported to burn cooler and exceed rated lamp life. The cushion-seal adapts itself to fit all R-40 and PAR-38 lamps whether long, short or off-center. It also helps protect the lamp against vibration and shock.

The unit is made of non-corrosive cast aluminum with a glazed porcelain heatproof socket. The silicon cushion-seal is backed with an impregnated asbestos heat barrier and locked in place by a rigid aluminum reinforcing disc. The unit is furnished completely wired with lead wires extending beyond a universally adjustable swivel arm for mounting to ½-in. pipe, wall bracket, pipe slip fitter, or any of a number of standard interchangeable splice box accessories. It carries U.L. approval for use with medium base or mogul reflector lamps in the standard 150-, 200-, 300-, and 500-watt sizes.



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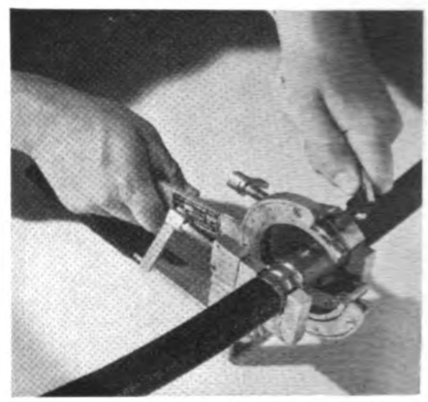
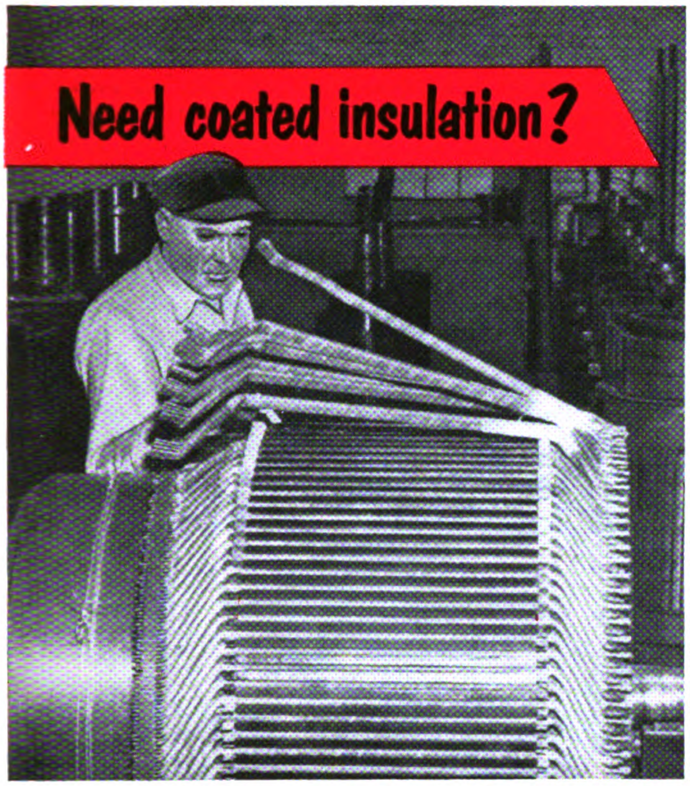


Splicing Connectors

The F. M. Anthony Company, 2022 Oakland avenue, Piedmont 11, Calif., is now manufacturing for railroad, as well as industrial, use a new line of electrical splicing connectors, terminals lugs, rubber and Neoprene insulating sleeves, and crimping tools under the name of Insul-Lock. The feature of this line is that it provides a single mechanical-type portable had-crimping tool which makes a full circumferential crimp and will crimp a range of wire and cable sizes from No. 4 up through 500,000 circular mils without changing dies or the application of heat. Yet the tool is light in weight (2¾ lb.), simple to operate and requires practically no maintenance. It works on a ratchet principle and rolls a crimp into the connectors and lugs.

The portable hand tool can be operated in tight places and is adapted to general industrial construction and maintenance wiring. It can be used in connection with a full line of two-way splicing connectors and terminal lugs for both flexible and standard stranded types of cable, also cable adaptors and other special fittings. For welding cable, pre-molded rubber and Neoprene insulating sleeves can be put on over their splicing connector with a special mounting tool. This saves time and makes the job permanent.



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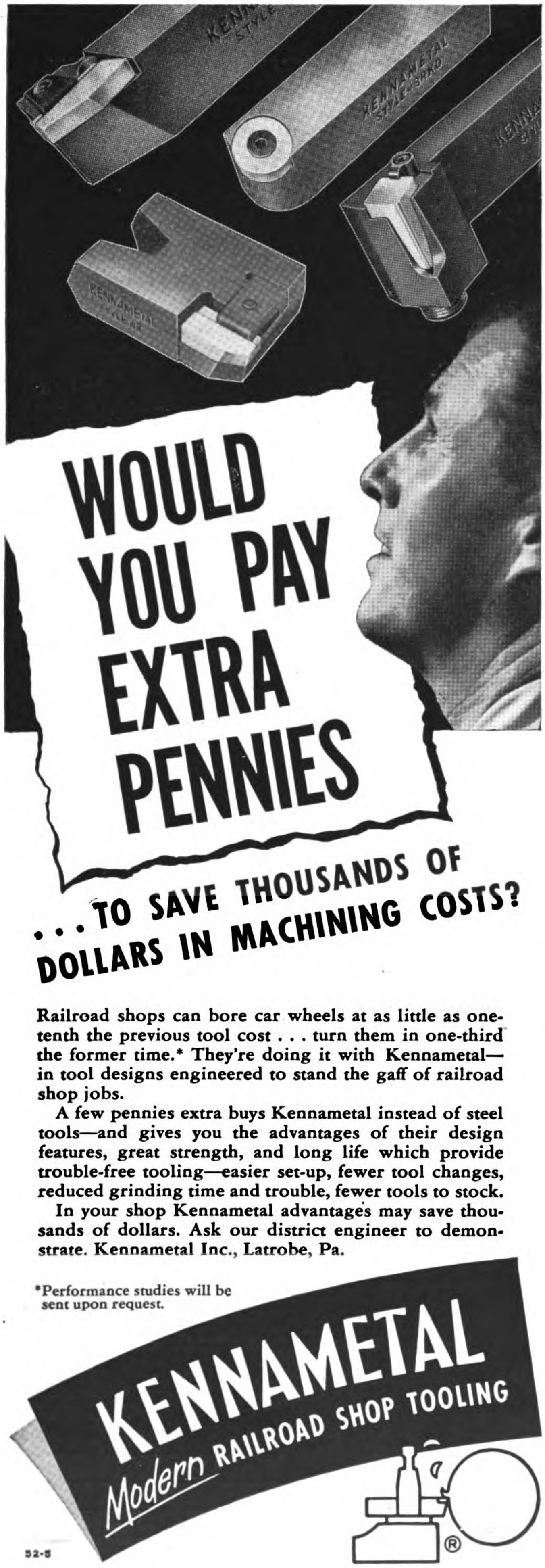

STATEMENT of the ownership, management, and circulation required by the Act of Congress of August 24, 1912, as amended by the Acts of March 3, 1933, and July 2, 1946 (Title 39, United States Code, Section 233): of *Railway Mechanical and Electrical Engineer*, published monthly at Philadelphia, Pa., for November, 1952.

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Editor, C. B. Peck, 30 Church St., New York 7, N. Y.

Managing editor, H. C. Wilcox, 30 Church St., New York 7, N. Y.

Business manager, C. W. Merriken, Jr., 30 Church St., New York 7, N. Y.

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C. B. PECK,
Editor.

Sworn to and subscribed before me this 18th day of September, 1952.

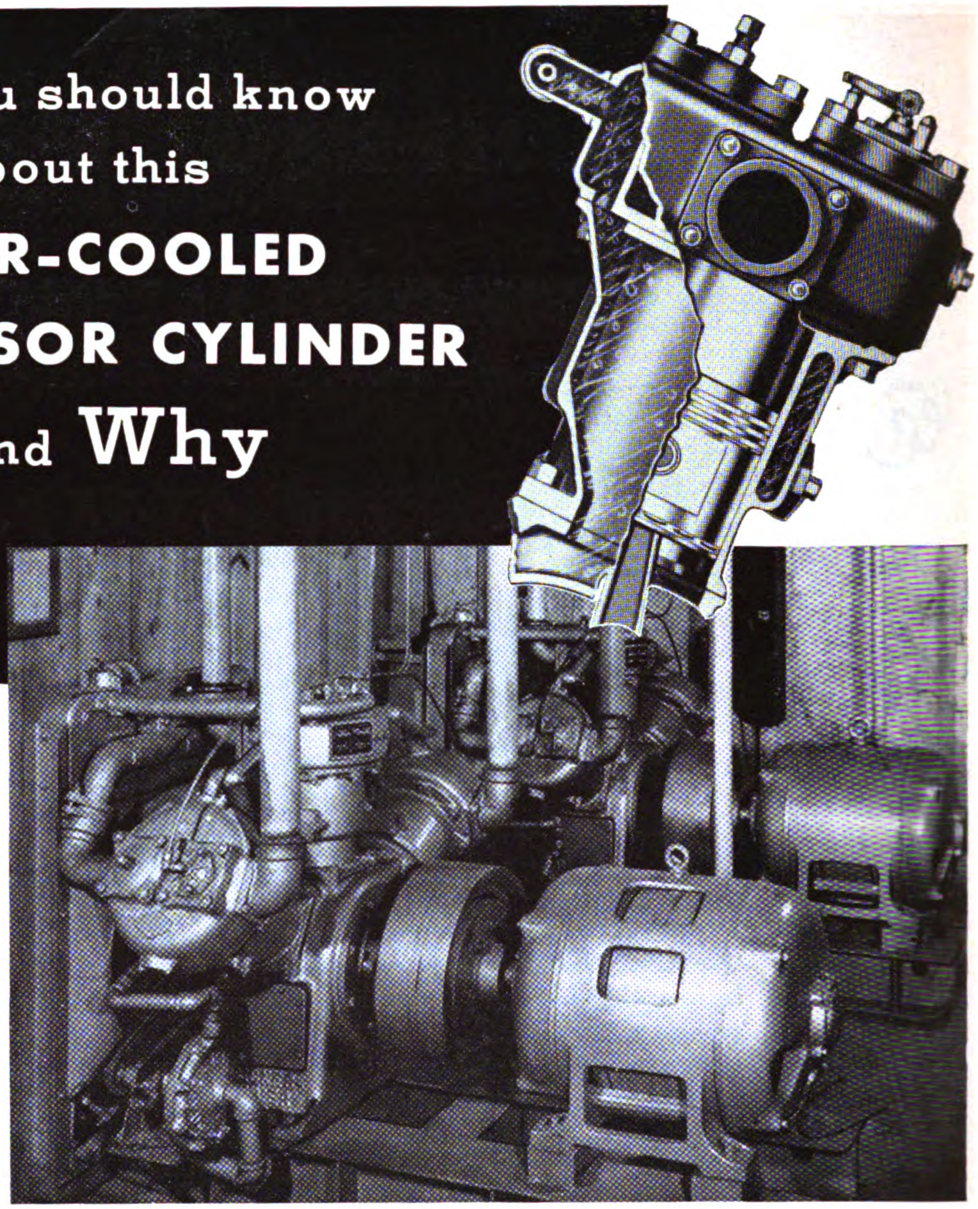
EDMUND J. PUYDAK.

[SEAL] (My commission expires March 30, 1953.)

what you should know about this

WATER-COOLED COMPRESSOR CYLINDER

. . . and Why



These two WB units provide compressed air for yard facilities of the St. Louis-San Francisco Railway at Wichita, Kansas.

If you are looking for an air compressor that runs cooler, delivers cooler air, requires less lubricating oil and lasts longer—then get acquainted with the Gardner-Denver *Water-Cooled WB*.

Completely water-jacketed compressor cylinders keep operating temperatures lower—keep cylinder wall temperatures uniform. Since there is less cylinder distortion, close manufacturing tolerances can be specified. As a result, lubrication is improved, oil pumping is eliminated, and cylinder wear is minimized.

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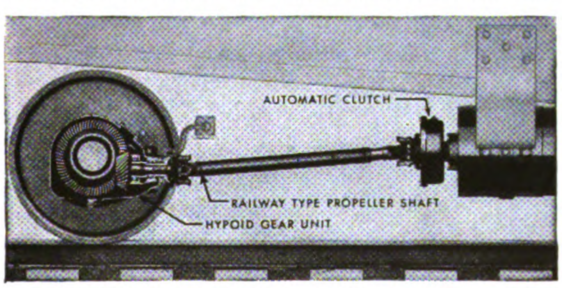
Spicer Generator-Drive Equipped

Deluxe travel facilities of the highest order are offered travelers between Kansas City and the deep South through the new *Kansas City Southern* streamliners.

There are chair cars with spacious lounges, picture windows, individual lighting and ample luggage space. The diners are divided into three rooms to create an intimate atmosphere. Tavern-lounge cars offer restful reading, lounging, entertainment and refreshment facilities. All compartments in the sleeping cars have wardrobes, toilets, circulating ice water, and temperature controls. Radio and wire-recorded music is provided in all passenger cars and sleeping rooms. The mail-baggage cars have wardrobes, toilet facilities, refrigerators and steam cookers for post office personnel; and berths, showers, wardrobes, and toilet facilities for dining car crews.

All this streamlined hospitality makes great demands upon electrical facilities such as lights, fans, radios, refrigeration, air conditioning, and other units. Ample and constant power for the generating units in the Kansas City Southern streamliners is supplied by Spicer Railway Generator Drives.

The Spicer Drive consists of a very simple application of long-lived hypoid gears and pinion mounted on the standard railway car axle. Features include high efficiency and economy, safety, quietness and smoothness. Write for full details and literature describing all the profitable advantages Spicer Positive Generator Drives make available to you.



This Spicer Railway Generator Drive is easily adaptable to old and new equipment

48 YEARS OF **Spicer** SERVICE

The Spicer Railway Generator Drive is manufactured, sold and serviced by

SPICER MANUFACTURING

Division of Dana Corporation

TOLEDO 1, OHIO

when the heat is on...

specify Okonite-Okoprene Diesel wiring

When Diesel locomotives burn up the mileage, there's always danger of burning up the wiring, too. High temperatures generated by a Diesel are rough on conventional types of wiring — that's why so many builders now specify Okonite-Okoprene Diesel Locomotive Wiring.

Okonite-Okoprene meets the flame test requirements of the Underwriters' Laboratories. To pass these tests a cable must not support combustion or communicate flame along the cables. In contrast to ordinary saturated fibrous coverings, Okonite's time-proved Okoprene sheath provides a barrier against continuous high temperature.

This tough Okoprene sheath withstands the other saboteurs of Diesel wiring, too. It is moisture resistant and mechanically tough, safeguarding the insulation against abrasion and other types of possible damage. Okoprene is particularly resistant to petroleum products in general use on Diesels, thus preventing swelling and softening of the insulation.

Okonite-Okoprene Diesel wiring is insulated with Okonite insulation — the same long-lived mineral-base rubber insulation that has been used so successfully for important electrical circuits by three generations of railroad men.

Bulletin RM-2078A gives full details of Okonite-Okoprene Type DEL Diesel Locomotive Wiring, for both conduit and exposed installations. Ask your Okonite representative, or write for your copy of this bulletin to: The Okonite Company, Passaic, N. J.

The best cable is your best policy

OKONITE SINCE 1878 ***insulated wires and cables***

1214

You can put the Brakes on Beam Maintenance Costs!

Don't take it for granted that high maintenance costs are a necessary brake beam evil. Over a billion car-miles with ASF Cast-Steel Unit Beams have proved just the opposite—and now you can get the economy of this same one-piece construction in hanger-type beams, too!

THROUGH LESS MAINTENANCE . . .

Instead of eight or more parts per beam, here's a rigid, one-piece casting that *stays* rigid. Insures a positive linkage—with nothing to flex or work loose. False piston travel is eliminated. Fulcrum and heads are cast integral . . . and permanently positioned. In short, the only adjustment of the ASF Hanger-Type Beam ever required is to compensate for brake shoe wear!

AND LONGER SERVICE LIFE . . .

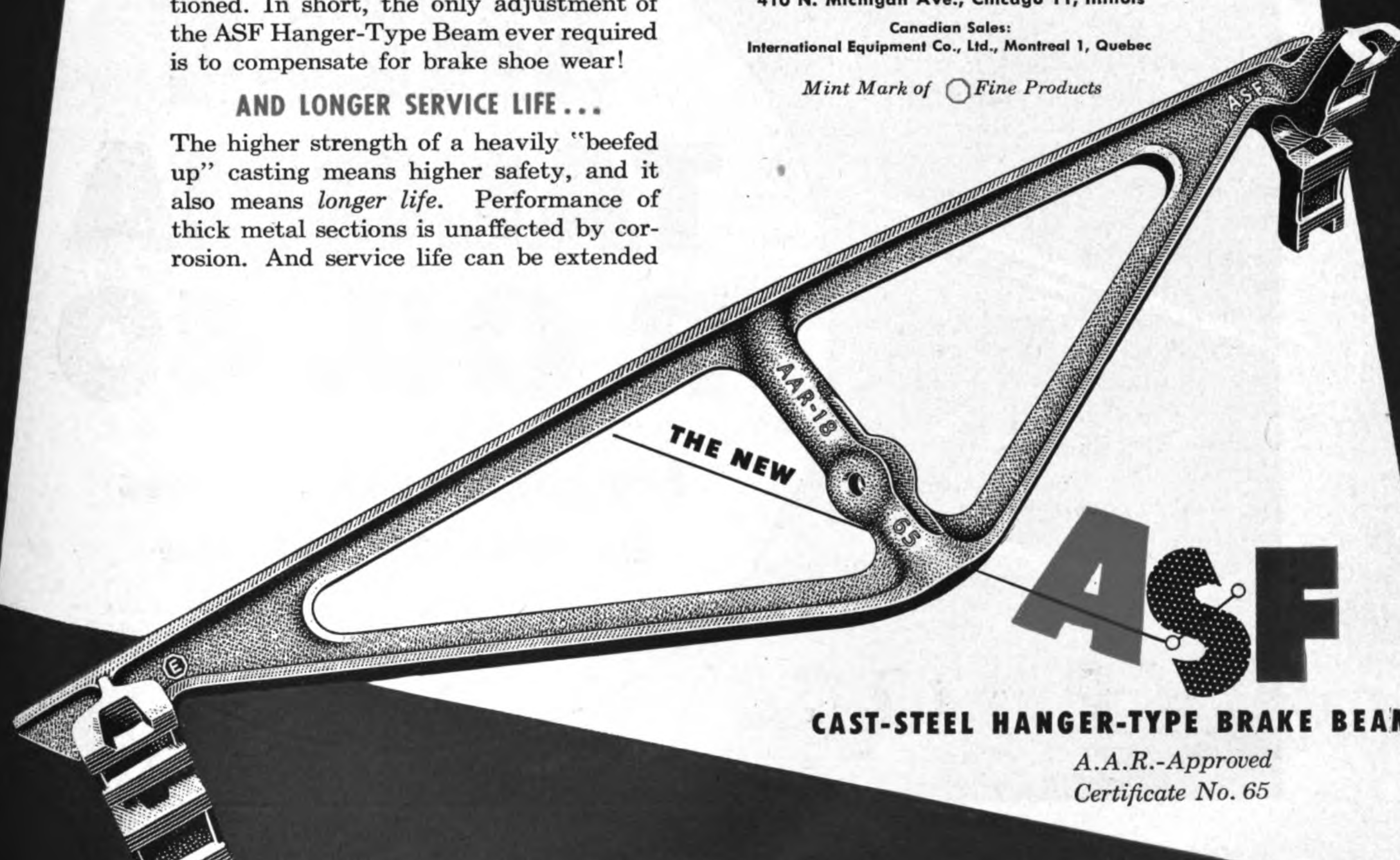
The higher strength of a heavily "beefed up" casting means higher safety, and it also means *longer life*. Performance of thick metal sections is unaffected by corrosion. And service life can be extended almost indefinitely . . . worn surfaces can easily be built up by welding; burned heads renewed by welding on new facings.

YOU SAVE DOLLARS!

The longer life and lower-cost maintenance of the service-proved ASF Cast-Steel Unit Beam add up to one thing: *fewer dollars spent keeping cars "on-line."* Your ASF representative can give you the facts on how the same low-cost dependability applies to the new *ASF Hanger-Type Beam.* Write us today.

AMERICAN STEEL FOUNDRIES
410 N. Michigan Ave., Chicago 11, Illinois
Canadian Sales:
International Equipment Co., Ltd., Montreal 1, Quebec

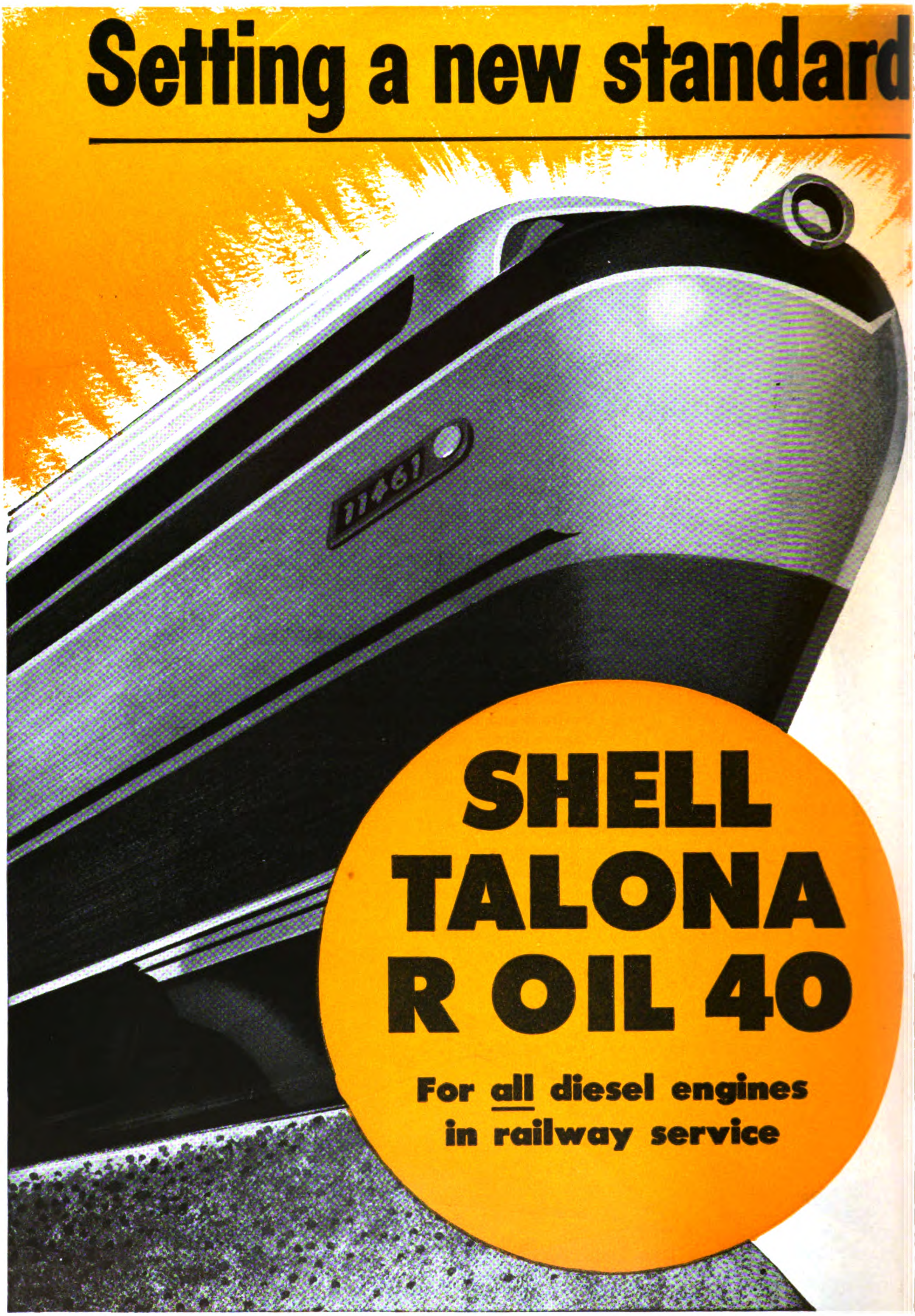
Mint Mark of Fine Products



THE NEW ASF

CAST-STEEL HANGER-TYPE BRAKE BEAM

A.A.R.-Approved
Certificate No. 65


Setting a new standard
11461
SHELL
TALONA
R OIL 40
For all diesel engines
in railway service

for anti-wear performance

An advance in railroad diesel lubrication that rivals the discovery of anti-sludge compounds!

SHELL TALONA R OIL 40 combats the main causes of diesel engine wear so successfully that accepted wear standards must now be revised. *This gain is achieved without sacrifice of any basic lubricating function.*

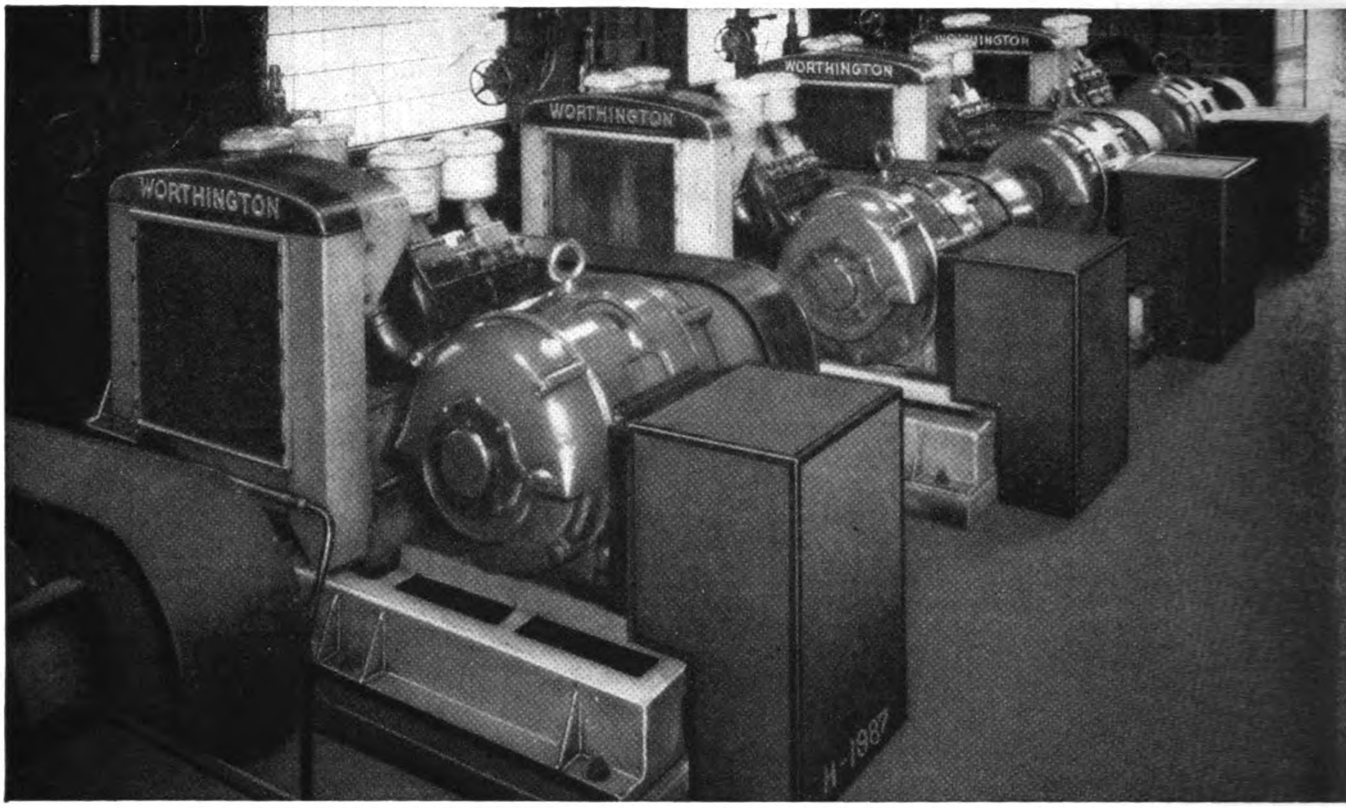
Especially favorable is the wear reduction at the critical top-cylinder zone. By maintaining original cylinder-wall and piston-ring dimensions longer, engine efficiency stays at a high level and crankcase contamination is greatly reduced.

Investigate the anti-wear advantages of Shell Talona R Oil 40 for *your own* diesel units.

SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA
SHELL BUILDING, ST. LOUIS 3, MISSOURI

SHELL ®



32ND ST., PITTSBURGH, AIR-COMPRESSOR STATION of The Pennsylvania Railroad Company, showing four of the five Worthington radial compressors, which make up a completely automatic system to supply air for charging the air brake system on cars, for emergency operation of track switches, and for lifting sand.

How Pennsylvania Railroad gets completely automatic operation from these Worthington Compressors

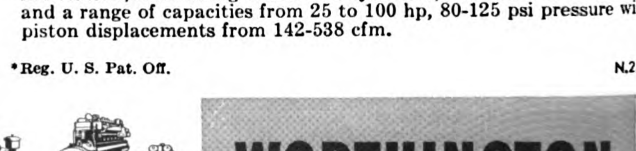
Some might call it "well integrated"—others might merely say "beautiful".

But however you look at it, this Pittsburgh yard compressor installation of the Pennsylvania Railroad is a model of order and efficiency. Any three of those clean-looking but rugged Worthington compressors make up a completely automatic system.

Here's how it works. One of the five units is selected to run continuously. A second unit is on constant speed control, while a third is available for automatic start and stop control. The remaining two compressors are available to furnish additional air in the event one of the large steam driven units at Pennsylvania Station Power Plant is shut down for repairs. In the event of power interruption with three compressors on the line, the three compressors will start up automatically in timed sequence rather than all-at-once—an important consideration from the standpoint of electrical starting load.

Worthington takes its hat off to the Pennsylvania R. R. Co. for setting up one of the most efficient compressor installations we've seen in any yard of this kind.

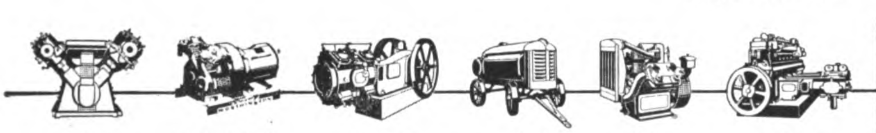
Write for more data on Worthington Radial Compressors in Bulletin H-630-B1 to Worthington Corporation, Vertical Compressor Division, Holyoke, Mass.



WHY DOES A WORTHINGTON PERFORM BETTER, LAST LONGER? Users can give you a number of reasons. Here's one: the exclusive Worthington Feather* Valve—lightest, tightest, most durable valve ever used. Cutaway shows the course of air through the valve. Other Worthington features: articulated connecting rods; completely filtered force-feed lubrication; fan cooling of isolated cylinders; Timken main bearings; and a range of capacities from 25 to 100 hp, 80-125 psi pressure with piston displacements from 142-538 cfm.

*Reg. U. S. Pat. Off.

N.2.1



Y-TYPES · BALANCED ANGLE · HORIZONTAL · PORTABLE · RADIAL · GAS ENGINE COMPRESSORS

WORTHINGTON

Compressors

No Other Compressor Will Outperform a Worthington

As the modern Diesel outperforms OLD 999

Nailable Steel Flooring outperforms other freight car floors

"Class I railroads in the first four months of 1952 installed in service 883 new locomotives. 878 of these were Diesels."*

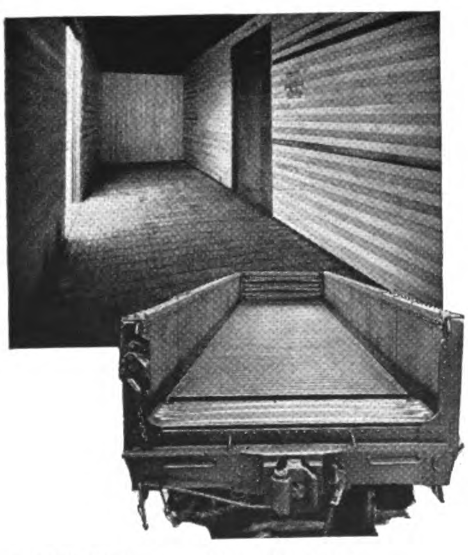
This is recognition of the Diesel engine's superior performance over other kinds of tractive power.

Naturally, there are good reasons for the railroads' switch to Diesels.

Likewise, more and more, America's leading railroads are recognizing the superiority of NAILABLE STEEL FLOORING for freight cars because:

- N-S-F and its exclusive nailing to steel feature mean greater security for lading of all kinds—and the nails used in blocking cannot damage the floor.
- N-S-F assures constant serviceability for boxcars and makes one type of gondola do the work of two.

These characteristics of N-S-F, made of N-A-X HIGH-TENSILE steel, mean greater structural strength for freight cars . . . greater efficiency in overall railroad operations.



*AAR Bulletin—May 19, 1952

N-S-F for NAILABLE STEEL FLOORING SAFER·STRONGER

PATENTS PENDING 52-SF-9

GREAT LAKES STEEL CORPORATION

STEEL FLOOR DIVISION • Ecorse, Detroit 29, Michigan

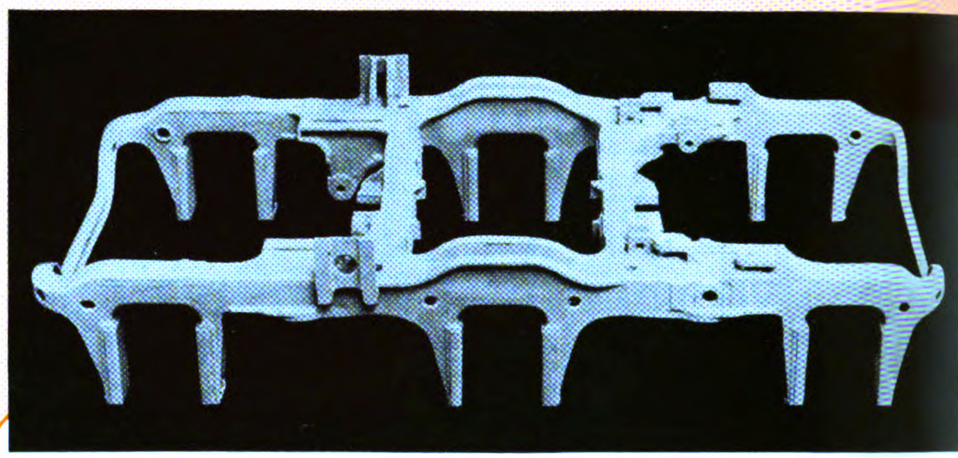
PRODUCER OF N-A-X HIGH-TENSILE STEEL

NATIONAL STEEL CORPORATION

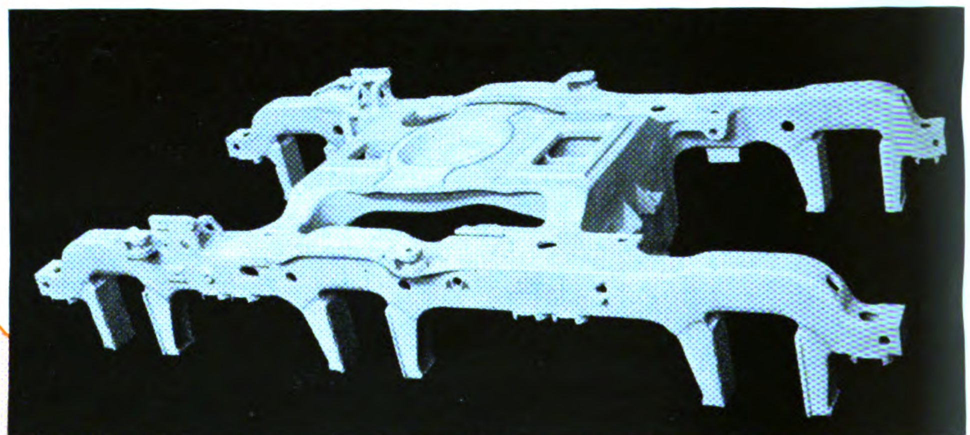
Sales representatives in Chicago, Philadelphia, St. Louis, Atlanta, Omaha, Denver, San Francisco, Montreal and New York

COMMONWEALTH

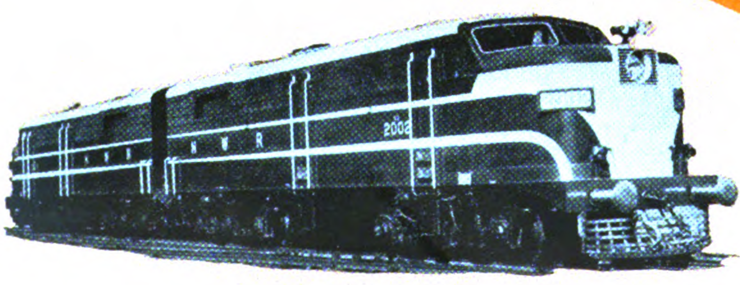
DIESEL LOCOMOTIVE TRUCKS...



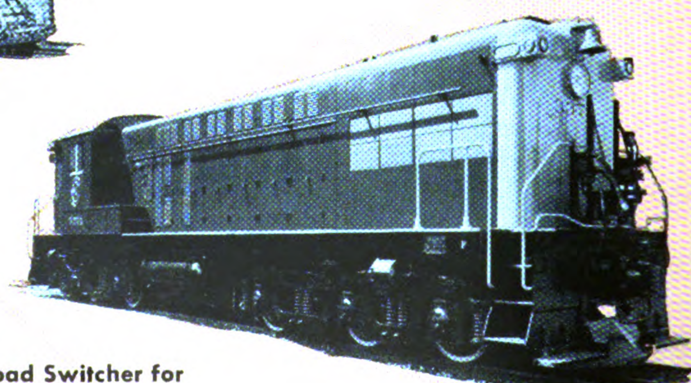
Commonwealth
Motor Truck Frame
(2 motor type)



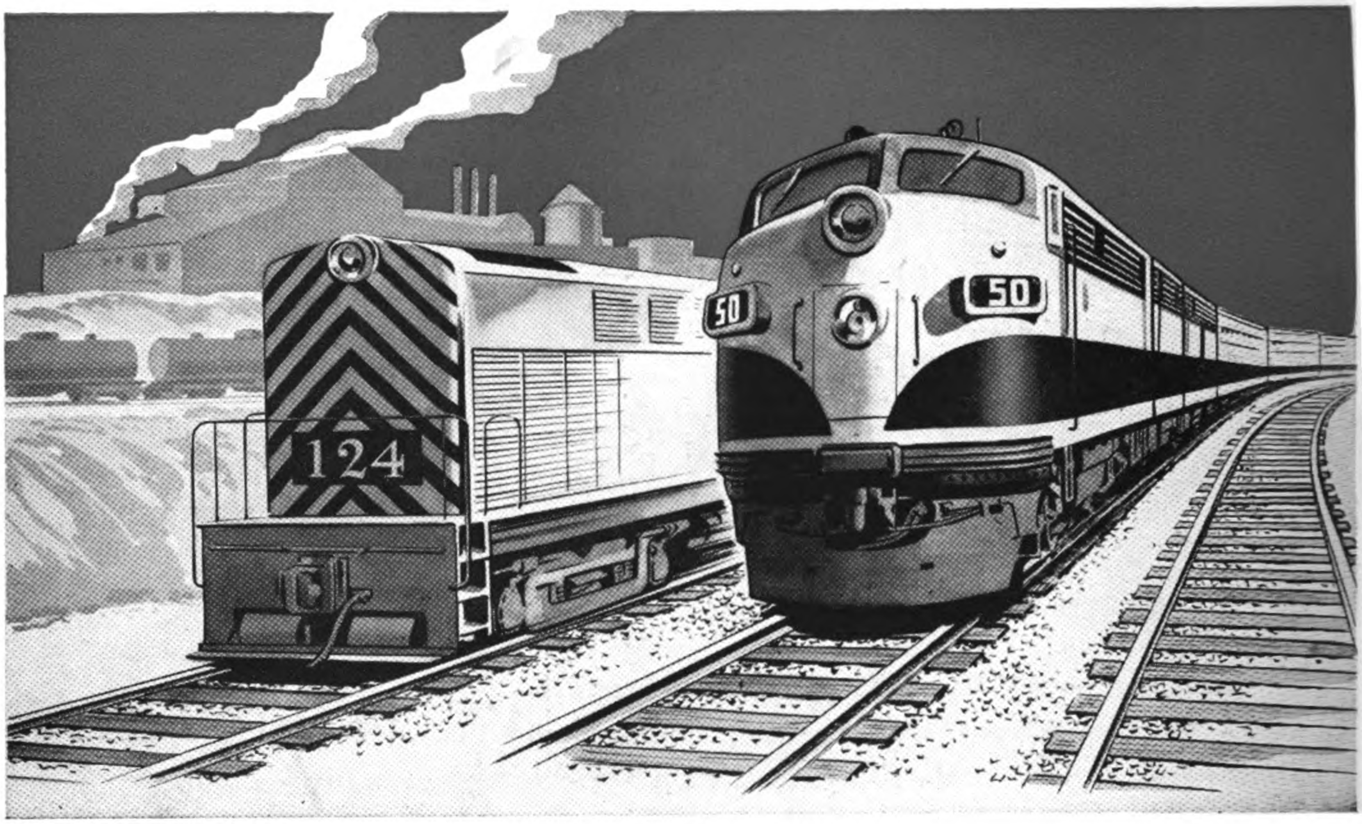
Commonwealth
Motor Truck Frame
(3 motor type)



3200 H.P. Freight and Passenger Locomotive
for North-Western State Railway, Pakistan



1600 H.P. Road Switcher for
Central Railway of Brazil



Humping or Highballing...

DIESEL ENGINES THRIVE ON WIX ENGINEERED OIL FILTRATION

There's a big difference between what happens to lubricating oil in a yard engine and in a main line locomotive. Factors such as speed, heat and contamination (to mention but a few) are completely different. Obviously these differences are reflected in the performance of the lubricating oil and filter cartridge. That is why WIX Engineered Filtration provides a choice of filtrants to suit *your* service conditions . . . enabling you to tailor *your* oil filtration to *your* needs. This facility is rolling up splendid performance records on more and more leading roads.

Whatever your preference, there is, in WIX Engineered Filtration the ideal construction for *your* particular service. There's the famous WIX interlapped white cotton thread construction . . . colored waste . . . amazing new resilient density blends . . . a special new filtrant . . . all engineered to rid lubricating oil of grit, dust and sludge! To keep engine performance UP and engine maintenance DOWN . . . *Clean It Up With WIX!* Write for particulars today!

Precision construction . . . controlled density . . . uniform quality . . . self-contained sealing gaskets and many other WIX *plus* features add up to WIX Engineered Filtration. Whether for Lubricating Oil or Fuel Oil, the dollar and cents record of WIX Filter Cartridges shows a decided advantage for you.

wix

TRADE MARK REG.

ENGINEERED FILTRATION

RAILROAD OIL FILTERS

WIX ACCESSORIES CORP. • GASTONIA, N. C.

WIX ACCESSORIES CORP. LTD. • TORONTO, CANADA

WAREHOUSE STOCKS IN: GASTONIA • ATLANTA • ST. PAUL • CHICAGO • CLEVELAND • ST. LOUIS • OAKLAND

MOTOR WHEEL

Deep Flange

JOURNAL BOX LIDS

① Hinge-pin supported by ¾" lid bearings. Worn holes and hinge-pin scoring eliminated.

② Stops hold straight hinge-pin in position under spring pressure. NO TOOLS NEEDED TO INSERT OR SECURE HINGE-PIN.

③ Keeper-pin holds assembly during storage. After hinge-pin is inserted, hand pressure permits removal of keeper-pin WITHOUT USE OF TOOLS.

④ Coil spring and roller assembly, held snugly by sheared ears, lets lid open and close easily without wear on journal box lug.

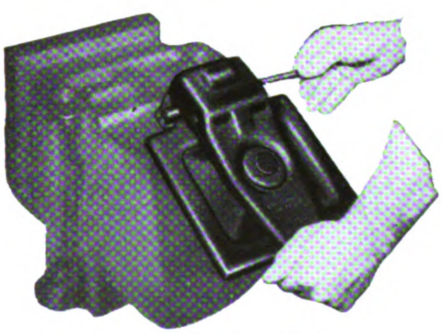
⑤ Oil-tight center construction permits full articulation up, down, left and right to insure a tight fit.

⑥ Full pressed steel construction, 3/16" in housing and 5/32" in cover.

⑦ Opens 120° for easy access to journal.

⑧ Extended housing arm eliminates opening and closing strain on articulating point.

Give You 8 Superior Features plus *Added Protection*



NO TOOLS NEEDED

Neither the standard flange Motor Wheel Journal Box Lid illustrated above nor the Deep Flange model requires the use of tools to attach or detach.

The Deep Flange provides added protection from wind currents carrying foreign matter and moisture so harmful to efficient lubrication. Laboratory and field tests, plus the experience of thousands of lids in use, have proven the merits of the Deep Flange design.

NATIONAL RAILWAY SALES REPRESENTATIVE

T-Z RAILWAY EQUIPMENT CO.

8 S. Michigan Ave. Chicago 3, Ill.

MW

MOTOR WHEEL CORPORATION

LANSING 3, MICHIGAN, U.S.A.

To assure highest mileage and utmost safety at high speeds

"Nickel Plate Road" uses U·S·S MULTIPLE-WEAR WROUGHT STEEL WHEELS

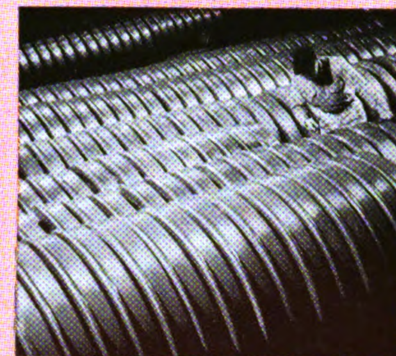
U·S·S WROUGHT STEEL WHEELS

One-Wear Freight Car Wheels
Multiple-Wear Freight Car Wheels
Passenger Car Wheels

Diesel Locomotive Wheels
Steam Locomotive Wheels
Electric Locomotive Wheels

Tender Truck Wheels
Electric Transit Wheels
Crane Track Wheels

THIS IS ONE of 2500 70-ton hopper cars, equipped with U·S·S Multiple-Wear Wheels, built for the New York, Chicago & St. Louis Railroad in recent years. Their reputation for dependability in service has made U·S·S Multiple-Wear Wheels the favorites wherever heavy hauling is done.



Here are a few reasons why U·S·S Wrought Steel Wheels are better . . .

● On this recently developed semi-automatic wheel boring mill—the last word in speed and precision—wheel hubs are rough bored ¼″ less than finished bore, or are finished bored to customer specifications.

● They're made right. On modern high speed machine tools like this, wheels are accurately machined to specified tolerances.

● A careful check of essential dimensions is the final inspection step that makes sure that U·S·S Wrought Steel Wheels meet customers' specifications. You get only the best.

on 3,000 70-ton cars

THE heavier wheel loads now carried, the greater distances traveled, and the high speed at which railroad equipment must move today have put a premium on wheel durability and safety.

That's why so many of the country's railroads like the New York, Chicago & St. Louis are installing U·S·S Multiple-Wear Wrought Steel Wheels on their heavy-duty equipment. These rugged wheels are good for the long run . . . *deliver more ton-miles per dollar than any other type wheel.* Here's why . . .

U·S·S Multiple-Wear Wrought Steel Wheels keep replacement cost *way* down. They're built to take the punishment of impact at high speeds and long, severe braking. Turned out in shops equipped with modern heat treating, forging and machining facilities U·S·S Wrought Steel Wheels are carefully controlled in every step of manufacture from the melting of the steel to the finished product. And they're backed by 47 years of wheel-making experience.

U·S·S Wrought Steel Wheels can be furnished either rim toughened or entirely quenched for other high-duty service. And two complete wheel shops—one at McKees Rocks (Pittsburgh), Pennsylvania, and the other at Gary, Indiana—make it possible to meet your requirements for steel wheels more efficiently . . . and more promptly.

The next time you order wheels for new equipment or for replacements, specify U·S·S Multiple-Wear Wrought Steel Wheels. No finer wheels are available anywhere.

THIS IS ONE of 500 70-ton gondola cars built for the Nickel Plate Road. Because years of hard, fast service are ahead for this car, it rolls on long-life U·S·S Multiple-Wear Wrought Steel Wheels. You can't get any better.

UNITED STATES STEEL COMPANY, PITTSBURGH, PA. • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S WROUGHT STEEL *High-Duty* WHEELS

2-966

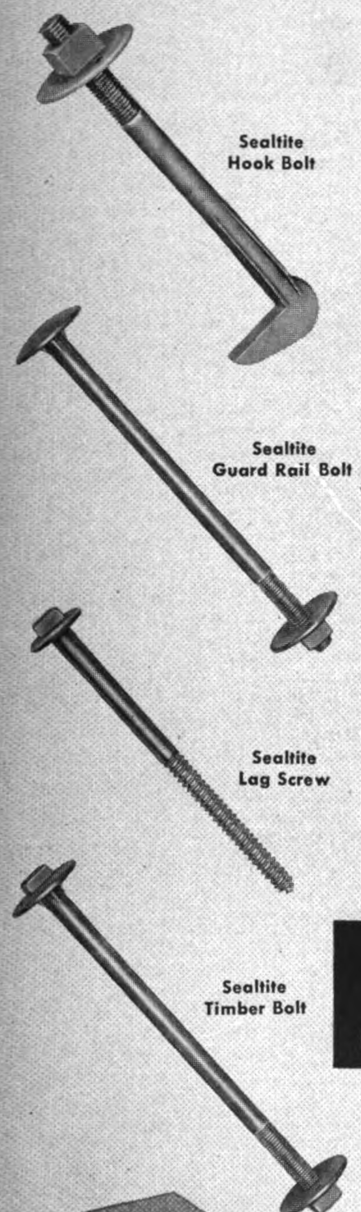
UNITED STATES STEEL


SCULLIN L-V 50 TRUCK
STEEL CASTINGS MANUFACTURER
NEW YORK
CHICAGO
BALTIMORE
RICHMOND, VA.
SCULLIN
LATERAL VERTICAL
50
CUSHIONED MOTION
TRUCKS
THE SMOOTHEST TRAFFIC-BUILDERS
BETWEEN LCL AND YOUR RAILS
Photo Courtesy
Baltimore & Ohio Railroad
SCULLIN STEEL CO.
SAINT LOUIS 10, MISSOURI

FOR CLASS 1 PERFORMANCE, SPECIFY

Lewis

Sealtite railroad fasteners



The nation's great railroads use Lewis Sealtite fasteners. Accurately engineered, designed to do a better job, Sealtite products are tough, durable, made of finest grade metals for heavy duty. They meet the most exacting specifications.

More than 20 years of manufacturing experience have established Sealtite's top quality in the industry. Such famous Sealtite features as the patented fins, for better seating, Sealtite's accurate threading, for easy installation, and many others, have given Lewis Sealtite products a "Class I" reputation in the field.

The next time you specify fasteners, specify Lewis Sealtite, a complete line of first grade fasteners for America's leading railroads.

All Sealtite products are available in HOT-DIP GALVANIZED, SEALED-IN-ZINC finish, which stops rust and corrosion. Tests prove that the molten zinc bath gives Double-Life, greater economy through fewer replacements.

Serving 85% of America's Class 1 Railroads

See your Lewis representative, or contact factory for samples, prices, full details.

*One of many leading railroads using Lewis Sealtite products.

Lewis BOLT & NUT COMPANY
504 Malcolm Ave. S. E.
Minneapolis 14, Minnesota

LOOK FOR THIS STAMP OF QUALITY

Sealtite Bolts available with Loktite Nut #2, washer nut, or std. sq. and hex. nuts.

WATERTIGHT SEAL! Two layers of "Scotch" Electrical Tape No. 21 seal traction motor leads against moisture, dust and dirt.

Triple-thick plastic tape "buttons up" the sleeves on traction motor leads!

No wonder "Scotch" Electrical Tape No. 21 lasts so long on traction motor leads! It's three times as thick as ordinary plastic tape, gives plenty of protection against abrasive undercar blasts.

Like its super-thin companion "Scotch" 33, "Scotch" Electrical Tape No. 21 has a vinyl plastic backing that resists weathering and sunlight, acids, oils and alkalies. It's *dependable,* and it saves you money since it takes very little to do a big job.

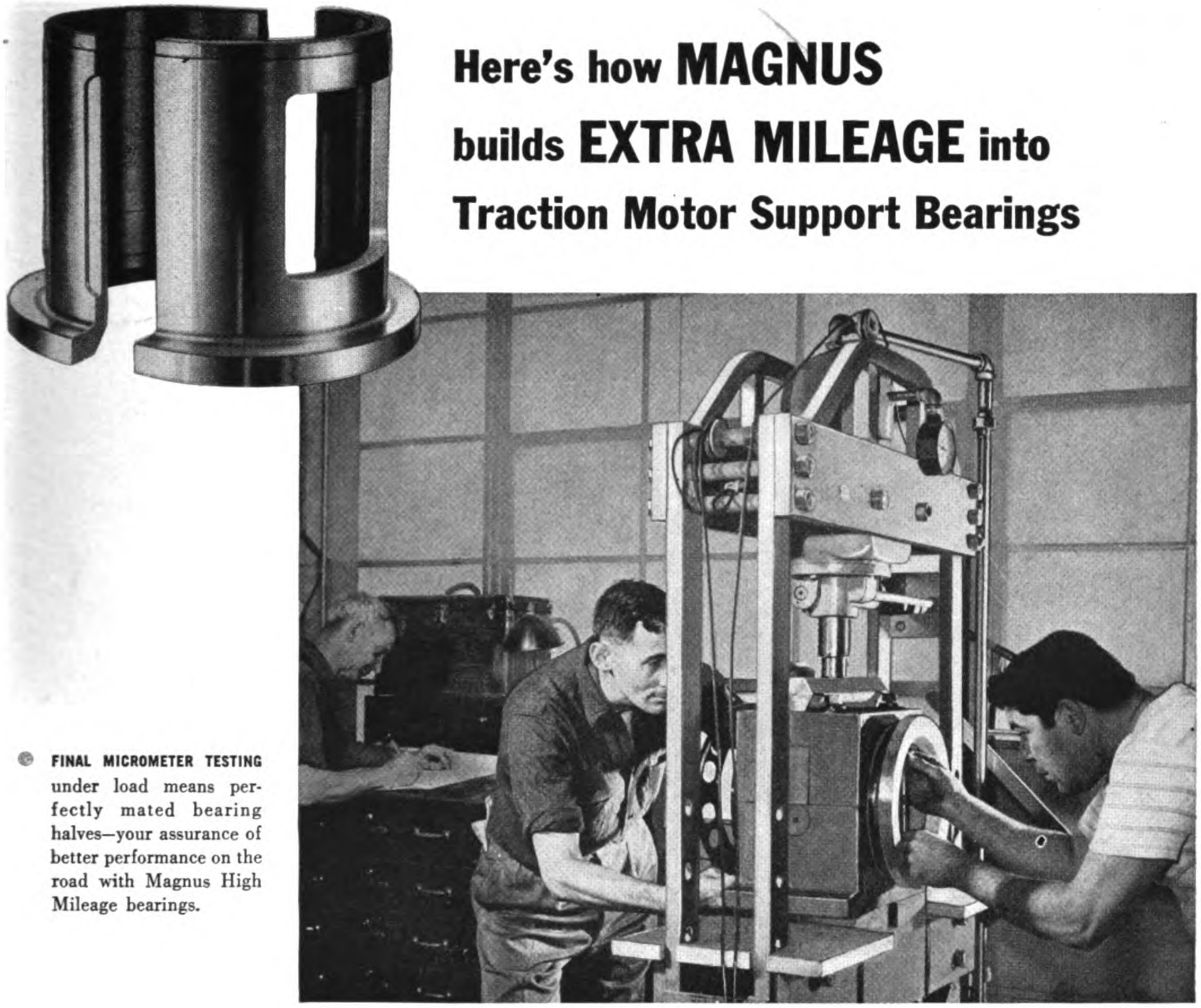
This triple-thick tape is just one of a large family of "Scotch" Electrical Tapes. And there's one for practically every requirement.

For the *right* "Scotch" Electrical Tape for *your* job, write Minnesota Mining & Mfg. Co., Dept. RE-11, St. Paul 6, Minn. We'll tell you where to get it right away.

FOR NEAT SPLICES in tight places try "Scotch" Plastic Electrical Tape No. 33. New ¾-in. x 20-ft. "Job Size" rolls are packed 12 to a sturdy screw-top container that keeps out dust and dirt, prevents bruised rolls. Order today from your supplier! Be ready for speedy splicing.

The term "Scotch" and the plaid design are registered trademarks for the more than 200 pressure-sensitive adhesive tapes made in U.S.A. by **Minnesota Mining & Mfg. Co., St. Paul 6, Minn.,** also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 122 E. 42nd St., New York 17, N.Y. In Canada: London, Ont., Can.

Here's how MAGNUS builds EXTRA MILEAGE into Traction Motor Support Bearings



FINAL MICROMETER TESTING under load means perfectly mated bearing halves—your assurance of better performance on the road with Magnus High Mileage bearings.

Putting cost-saving extra miles into precision bearings is a real art with Magnus. It means a lot of extra care in manufacture that really pays off in performance: Magnus Traction Motor Support Bearings are setting mileage records in Diesel locomotives the country over.

Here are just a few highlights of Magnus HIGH MILEAGE bearing production:

- **SATCO LINING METAL** gives greater resistance to wear and load — stronger bonds — increased hardness at high temperatures.
- **IMPROVED FLANGE FILLET PROFILE** prevents "riding" the fillet and "feathering" of the lining metal.
- **HI-STRENGTH BRASS BACKS,** made from high-tin, fine-grained wearing metal mixes that are *Magnus-guaranteed.*
- **COMMUTATOR-PINION END INTERCHANGEABILITY** — a Magnus-pioneered improvement that simplifies maintenance and saves in bearing stockpiling.

Magnus HIGH MILEAGE Traction Motor Support Bearings are available for replacement on every type and make of diesel-electric and electric locomotives, and "MU" cars. For complete information, send for your free copy of Bulletin No. 6000. Just write a post card or letter to Magnus Metal Corporation, 111 Broadway, New York 6, N. Y.; or, 80 E. Jackson Boulevard, Chicago 4, Ill.

MAGNUS

High Mileage

TRACTION MOTOR SUPPORT BEARINGS

...for every type and make of diesel locomotive

MAGNUS METAL CORPORATION *Subsidiary of* **NATIONAL LEAD COMPANY**

WATERTIGHT SEAL

Triple
the

No wor
lasts so
three ti
gives pl
underca

Like
"Scotc
plastic
sunlig

FOR
trical
pack
dust
you

Eliminate journal lubrication between wheel-turnings!

Grease-lubricated TIMKEN® bearings go full wheel-turning period without attention!

ROM wheel-turning to wheel-turning, grease-lubricated Timken® bearings need no attention!)erating tests on passenger cars and diesels in gular service prove it! In fact, in one of these tests, ease-lubricated Timken bearings ran over 200,000 iles without adding any lubricant.

Wheel-turning to wheel-turning grease lubrication of Timken bearings will bring important new economies to the railroads. They'll eliminate man-hours previously needed for checking and addition of lubricant between wheel-turnings. And they'll save on lubricant itself.

Already three leading railroads have made the switch from oil to grease lubrication of their Timken bearing equipped passenger cars. And right now more than a dozen other railroads are testing wheel-turning to wheel-turning grease lubrication of their Timken bearings with favorable results.

Railroad operating tests show that Timken bearings are the *only* railroad journal bearings using an AAR-approved grease which consistently can go a full wheel-turning period without addition of lubricant. And Timken bearings can be converted from oil lubrication to grease without modifying the bearings or buying extra journal parts.

We'll be glad to help you investigate the cost-saving advantages of grease lubrication of Timken bearings on *your* railroad. Write The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

Eliminate journal lubrication between wheel-turnings!

Grease-lubricated TIMKEN® bearings go full wheel-turning period without attention!

FROM wheel-turning to wheel-turning, grease-lubricated Timken® bearings need no attention! Operating tests on passenger cars and diesels in regular service prove it! In fact, in one of these tests, grease-lubricated Timken bearings ran over 200,000 miles without adding any lubricant.

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TIMKEN
TRADE MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

Fire hazard eliminated—by proper cleaning!

There's more to cleaning running gear than meets the eye. For though every road takes pride in the appearance of its locomotives, it should be especially concerned with the very real danger of fire made possible by incomplete cleaning of running gear.

Hidden spots may be untouched during several cleanings. In time, these spots collect a thick layer of oily dirt. Just one red-hot spark from a brake shoe can set this "tinder" aflame. If there's a large oil tank nearby, the damage can run into thousands of dollars within seconds!

Railroaders can help eliminate this hazard by stressing *thorough* cleaning to workmen, and by using hard-working cleaning materials—the kind Pennsalt supplies to leading roads all over the nation.

For the most efficient spray cleaning of running gear, Pennsalt recommends Cleaner No. 77—a heavy-duty alkaline cleaner that removes thick soil of all types, then rinses free quickly. When running gear must be cleaned in a confined area, Pennsalt Cleaner EC-10 is the choice for efficient, safe removal of soil. It is a mild, non-caustic, solvent emulsion cleaner that also acts as a rust inhibitor on steel parts.

For more information on these outstanding cleaners, or for aid in setting up a safer, more effective running-gear cleaning program, send the coupon to: Maintenance Chemicals Department, **East:** Pennsylvania Salt Mfg. Co., Philadelphia 7, Pennsylvania **West:** Pennsylvania Salt Mfg. Co. of Washington, 2168 Shattuck Ave., Berkeley 4, California.

Pennsalt Chemicals

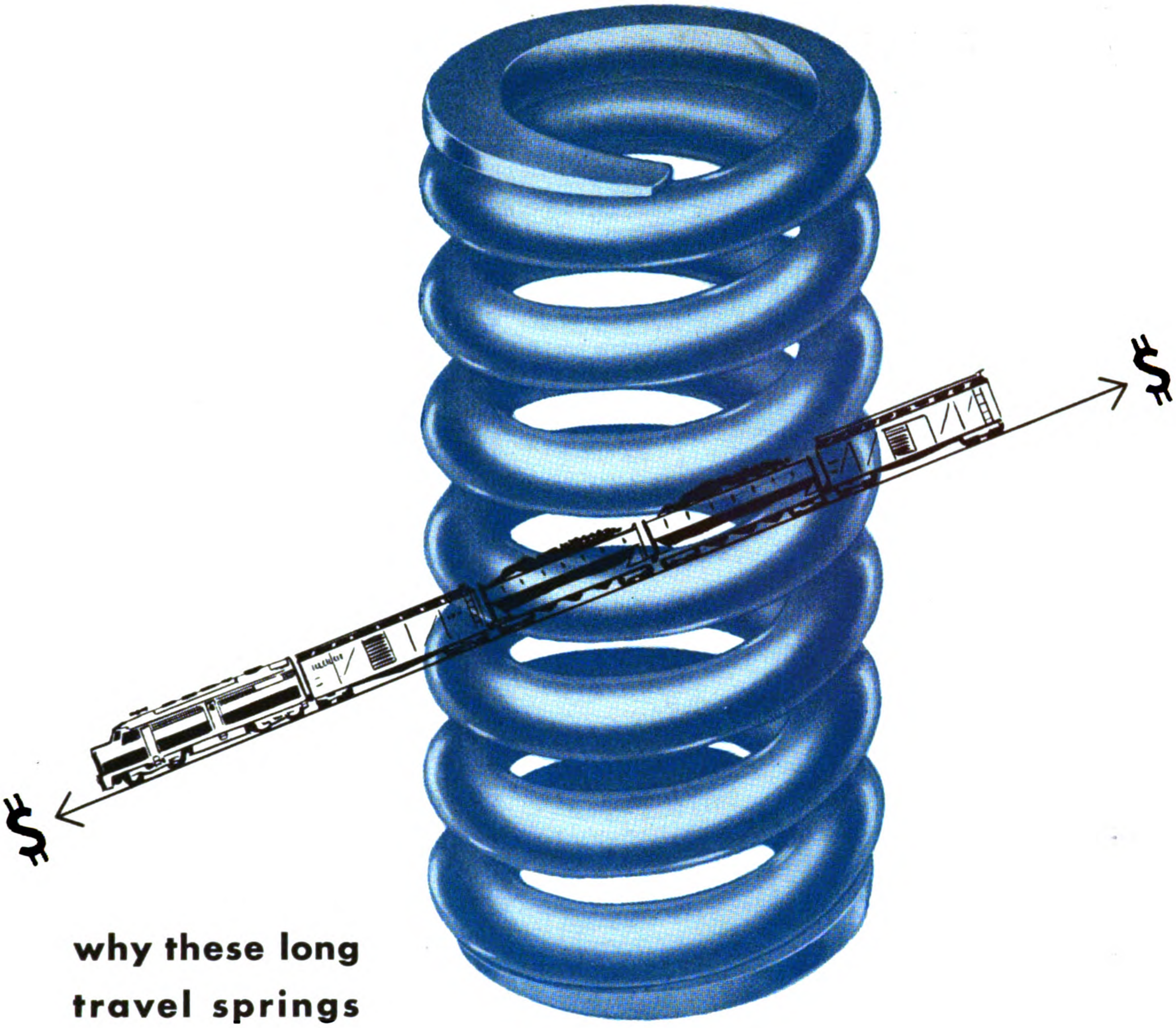
Send me information ☐ on these Pennsalt Cleaners
☐ on setting up a safer running-gear cleaning program.

Name ____________________

Company ____________________

Address ____________________

City ____________________



why these long travel springs

ARE YOUR SHORTEST DISTANCE TO MORE PROFIT

Higher revenue because of lower damage claims is one of the major benefits you receive with the long travel springs made by the Railway Steel-Spring Division. These rugged, heavy duty coil springs neutralize the effects of heavy jars and shocks. Result: not only are damage claims fewer but wear and tear on the rolling stock and roadbed also are reduced, saving a considerable sum on maintenance costs.

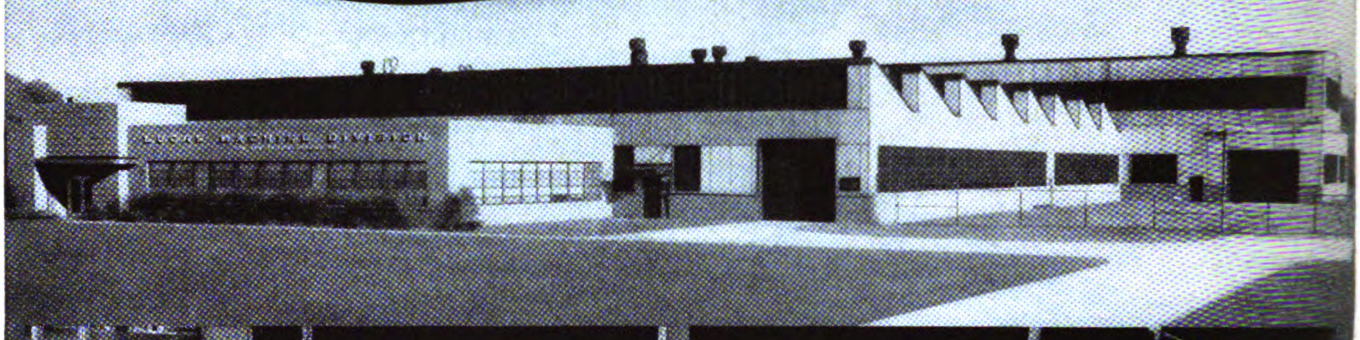
Such advantages are no accident; they are the result of the long experience of the Railway Steel-Spring Division, one of the oldest spring manufacturers in this country. For complete information, call your Alco sales representative in New York, Cleveland, Chicago, St. Louis, St. Paul, San Francisco.

Railway Steel-Spring Division

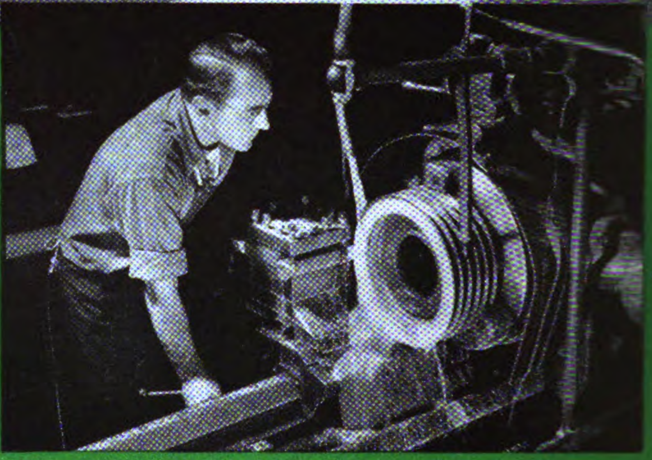
AMERICAN LOCOMOTIVE COMPANY

Only Lucas
CAN MAKE A LUCAS
. . . but others are lending a hand

This is one of America's outstanding plants of its kind, and every tool in it is there for the production of Lucas Horizontal Boring, Drilling and Milling machines. This specialization means a greater output of critically needed machines for the defense program.

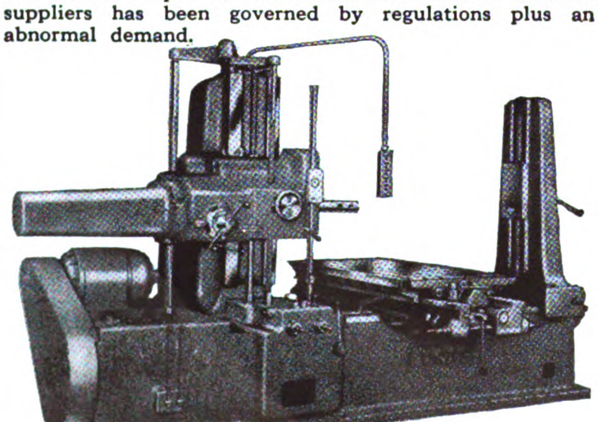


Thousands of man hours of exclusive experience on Lucas mills enable us to keep quality abreast of quantity.



Many an outside supplier is working 'round the clock on component parts to supplement our own efforts. Final assembly and inspection is still carried on in our own plant.

We still have to keep many a loyal customer waiting, because our output like that of all other defense machine suppliers has been governed by regulations plus an abnormal demand.



Your inquiry and your order are still as welcome as ever. When you do get the Lucas you need you'll find it your No. 1 money maker — the most used machine in the shop.

THE NEW BRITAIN MACHINE COMPANY
LUCAS
CLEVELAND

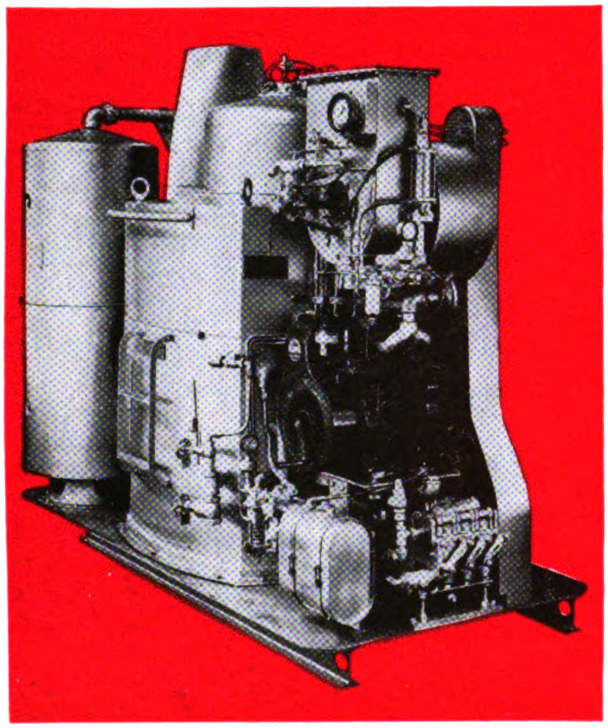
LUCAS
Precision

HORIZONTAL BORING, DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND 8, OHIO


BLUE STREAK
FAST FREIGHT
SSW
308

USING 561 FEET OF NATIONAL SEAMLESS TUBES

Midget generator drives giant pile driver



develops full pressure in just 2 minutes from a cold start

● This four-car railroad pile driving rig has a total weight of over *660,000* pounds.

On just 75 gallons of oil per day, the steam generator shown here* (similar to the type used to heat diesel powered passenger trains) will move the entire rig down the track at 15 to 20 miles per hour, drive the air brake compressor, operate the hammer continually and furnish steam for the hoist—all this in a generator you could put in an ordinary clothes closet!

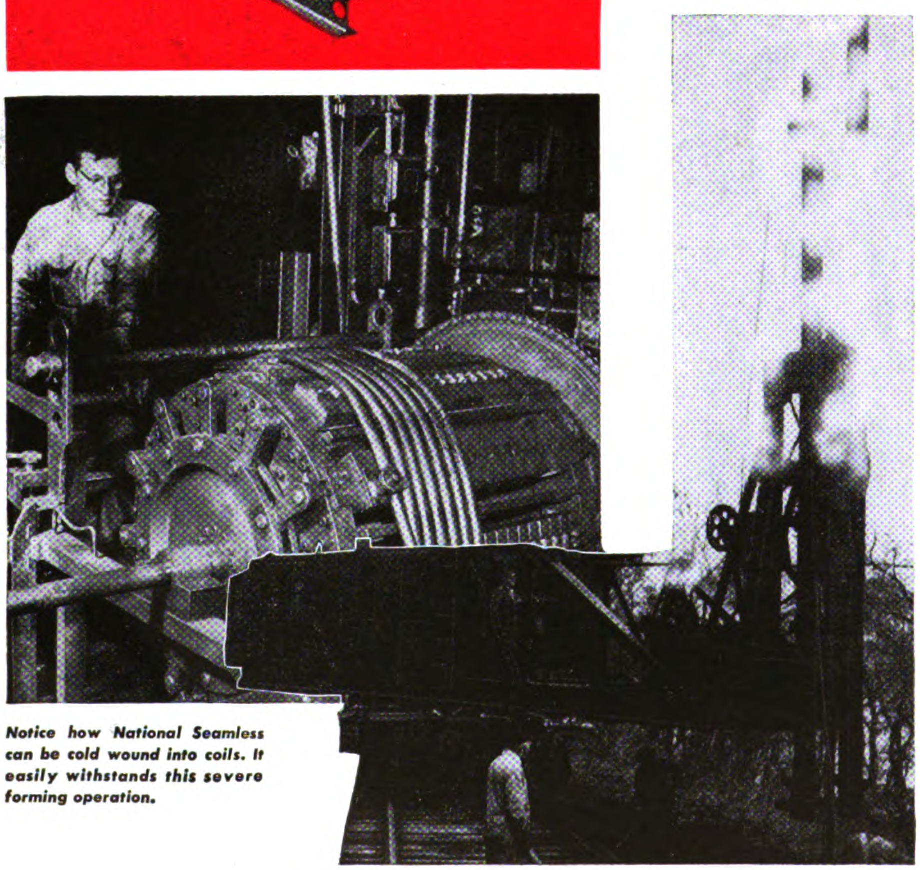
For size and weight, this is the most powerful steam-making machine ever developed.

Heart of this generator is a set of National Seamless Steel Tube coils over 561 feet long. Standard lengths are welded into 200 or 300 foot lengths, then cold rolled into a coil that must withstand a 1200 psi hydrostatic pressure test.

The National Seamless Tubes do a fine job despite the severe fabrication method and rigorous tests. These tubes can take it, because there aren't any welds to weaken or injure the tube. Every tube is actually pierced from a solid billet of high quality steel — the *one* manufacturing method that removes all doubt concerning uniform wall strength.

When you plan to use tubes in the future, be sure to specify National Seamless. They are made by the world's largest, most experienced manufacturer of tubular steel products.

**Manufacturer's name on request.*



Notice how National Seamless can be cold wound into coils. It easily withstands this severe forming operation.

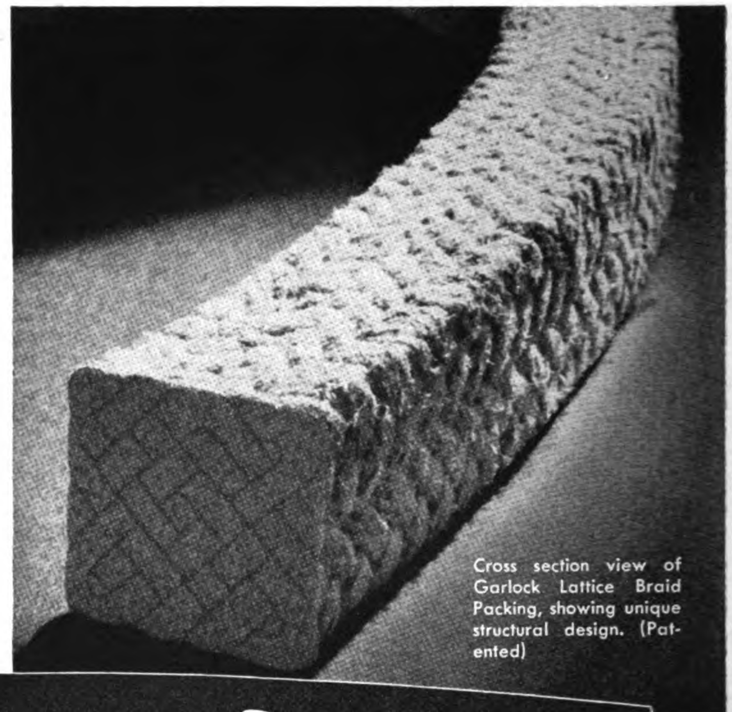
NATIONAL TUBE DIVISION, UNITED STATES STEEL COMPANY, PITTSBURGH, PA.
(TUBING SPECIALTIES)

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S NATIONAL *Seamless* TUBES

UNITED STATES STEEL

At Diesel Fueling Stations USE



Cross section view of Garlock Lattice Braid Packing, showing unique structural design. (Patented)

LATTICE-BRAID PACKING

Garlock 733 (asbestos) LATTICE-BRAID Packing

Garlock's specially designed machines for making LATTICE-BRAID Packing

TROUBLE-FREE and LONG-LASTING ON ROTARY FUEL PUMPS

The strands of Garlock Lattice-Braid packings are braided through and through linking them together into a single unit. This patented braiding process provides unusual flexibility and semi-automatic pressure action which keeps the packing properly adjusted in the stuffing box.

The flexible and pressure-responsive features of Lattice-Braid packings mean longer service with less attention. These are the reasons why Lattice-Braid packings are extensively used on rotary fuel pumps in diesel fueling stations. If you are not using Lattice-Braid packings write today for folder AD-131.

Lattice-Braid packing is manufactured from flax, cotton, asbestos, wire-inserted asbestos and "TEFLON"—for various types of service. Furnished in ring or coil form. Only Garlock makes Lattice-Braid packing.

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

GARLOCK

PACKINGS, GASKETS, OIL SEALS, MECHANICAL SEALS, RUBBER EXPANSION JOINTS

BROWNHOIST

BUILDS BETTER BULK MATERIALS HANDLING EQUIPMENT

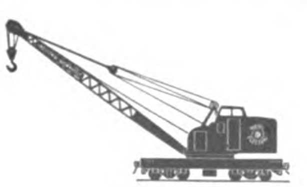
For over three quarters of a century Brownhoist has engineered, designed and built boat unloaders, storage bridges, cranes and car dumpers for efficient handling of coal, ore and other bulk materials in practically every corner of the world.

Railroads, steel mills and dock operators interested in machinery for handling ore, coal or other bulk materials will find that it pays to discuss their requirements with Brownhoist engineers.

Brownhoist equipment includes unloaders, fast plants, traveling bridge cranes, Diesel and Diesel Electric locomotive cranes, clamshell buckets, car dumpers, car pushers, shipyard cranes, and related machinery.

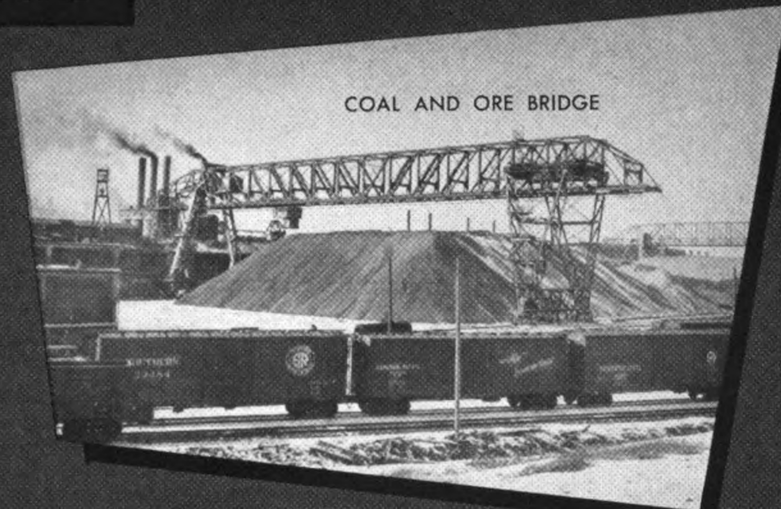
BROWNHOIST BUILDS BETTER CRANES

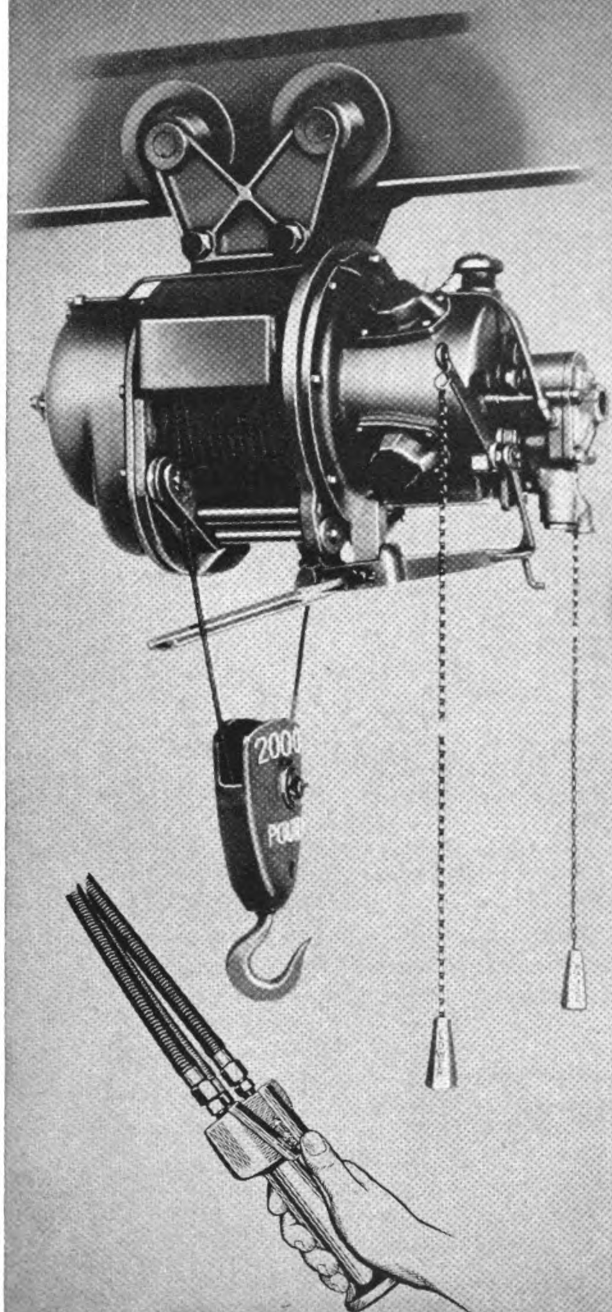
160



INDUSTRIAL BROWNHOIST CORPORATION
BAY CITY, MICHIGAN

DISTRICT OFFICES: New York, Philadelphia, Cleveland, San Francisco, Chicago, Canadian Brownhoist, Ltd., Montreal, Quebec • **AGENCIES:** Detroit, Birmingham, Houston, Los Angeles





A fast accurate producer on a variety of Diesel Jobs

Here is a case in point. A prominent midwestern road with a high complement of Diesels keeps the 54-in. Bullard Cut Master illustrated busy with a variety of Diesel work. Shown is a typical job — boring a freight Diesel generator bell housing for a bushing. Other operations on this particular job include boring the bushing, pressing the bushing in the housing and finally boring the bushing to fit a roller bearing.

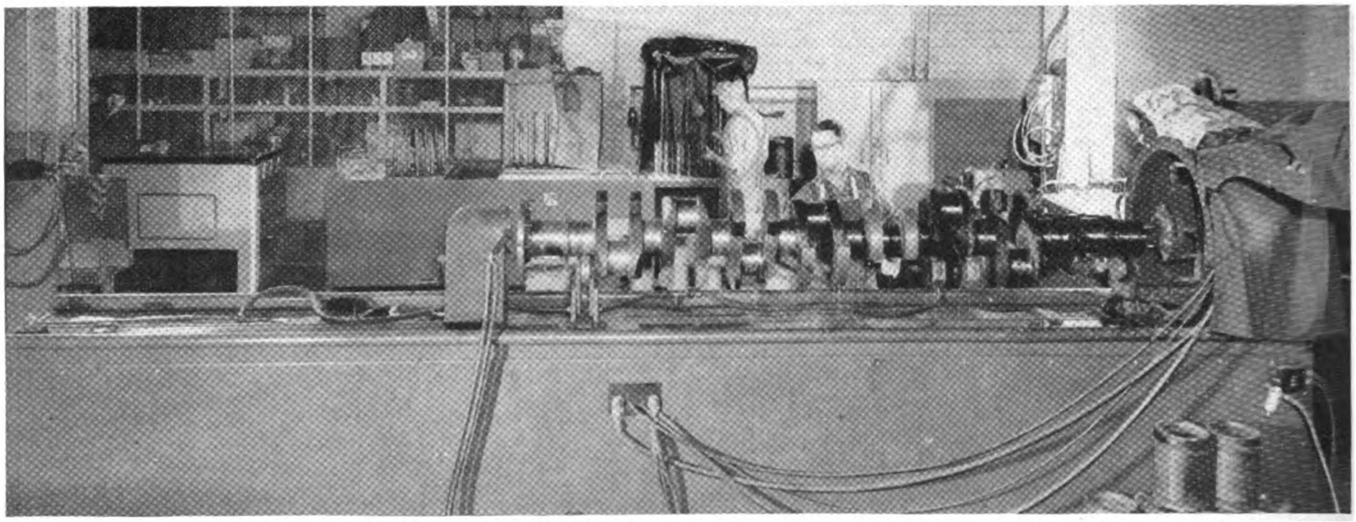
This versatile, fast-moving Cut Master with its wide range of speeds and feeds, is also utilized in this modern shop for boring gears for Diesel power wheels and for boring Diesel wheels.

BULLARD

Wherever the Cut Master is used it gives shop schedules a big lift — keeping costs down and providing economical, top-level performance for the big production job or the less-frequent but equally important miscellaneous runs.

THE BULLARD COMPANY

[redacted]



Applying MAGNAGLO bath to Diesel crankshaft at the Silvis, Illinois, shops of the Rock Island. Magnetic particle inspection under black light will reveal any defects as a glowing, easily interpreted indication. In the background is the ZYGLO inspection unit.

Keeping the Rockets Rolling

...without failure and at lower shop costs

On the Rock Island, inspection with MAGNAGLO and ZYGLO is saving time and money for the railroad and helping to give its patrons the fast, dependable service for which the "Route of the Rockets" is famous.

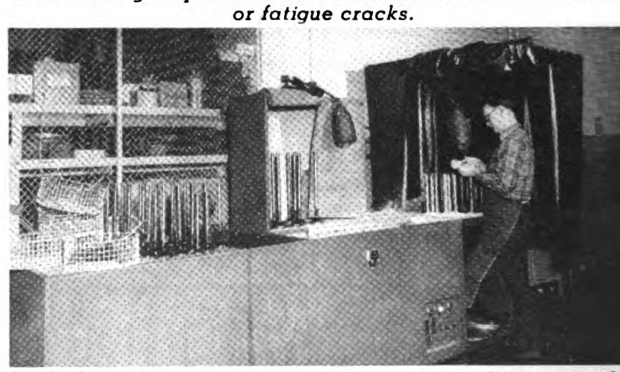
Whenever a Diesel comes in for its 1,000,000 mile overhaul, pistons, piston carriers, cylinder heads, crankshaft, basket, valves and valve springs are inspected by MAGNAGLO or ZYGLO.

This inspection has reduced materially the overall load of the shop department. There are fewer emergency repairs to be made. Almost never is an engine "chewed up" by a part that has broken or comes loose in service. Simple road failures, costly to the railroad and its users, are practically unknown.

MAGNAGLO and ZYGLO have smoothed out procedures in the shop, too. Defective parts, shown by inspection, to be capable of safe salvage, are reconditioned *on a convenient schedule* and become part of a revolving pool for use in other overhaul work.

What these MAGNAFLUX inspection methods are doing on the Rock Island is typical of the savings and improvements they have accomplished for dozens of other progressive railroads. Write today and we'll send you bulletins and reports *promptly*.

Piston being inspected with MAGNAGLO for overheating or fatigue cracks.



ZYGLO fluorescent penetrant inspection to locate cracks in exhaust valves.

MAGNAFLUX CORPORATION

Reg. U. S. Pat. Off.

MAGNAFLUX

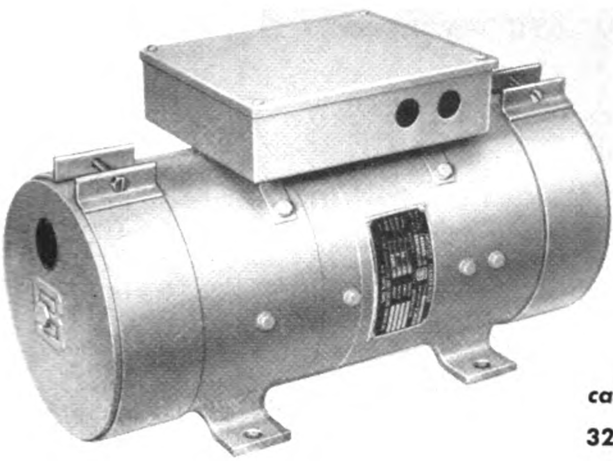
DETECTS DEFECTS

MAGNAFLUX CORPORATION
5920 Northwest Highway, Chicago 31, Illinois

New York 18 • Cleveland 15 • Detroit 11 • Dallas 9 • Los Angeles 58
Export Distributor: Curtis Wright Corp.
In Canada: Williams & Wilson, Ltd.

"SAFETY" Conversion Equipment...

DC to DC . . .

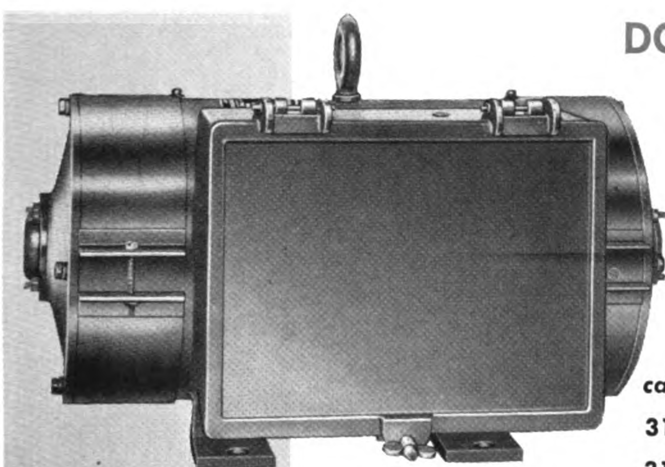


"Safety" Motor Generators . . . for DC to DC power conversion . . . signaling and battery charging applications . . . close inherent output voltage regulation regardless of input voltage variations.

cat. no.	*watts*	*dc input*	*dc output*	*rpm*
321258	200	64 volts	32 volts	2500
320560	200	32 volts	6.8 volts	2500

Motor Generator Units of 300, 1200 and 1500 watts are also available.

DC to AC . . .



"Safety" Motor Alternators . . . for DC to AC power conversion . . . inherent frequency and voltage regulation . . . used wherever single phase, 60 cycle AC output, is required for communication equipment.

cat. no.	*watts*	*dc input*	*ac output*	*rpm*
314132	300	32 volts	115 volts	1800
314131	300	64 volts	115 volts	1800
314190	300	115 volts	115 volts	1800

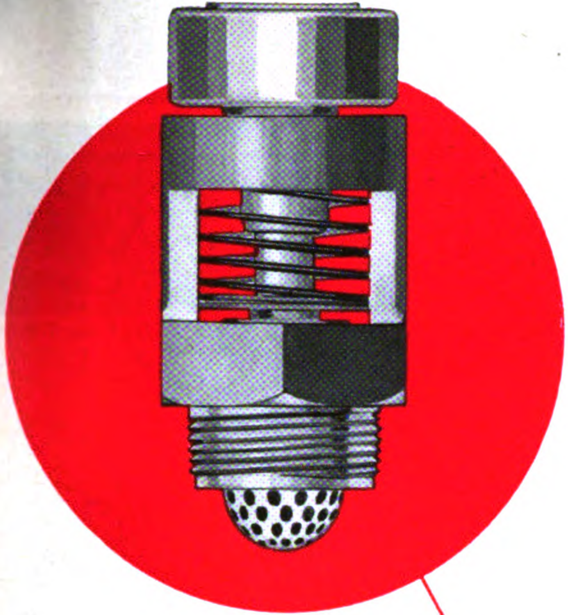
Motor Alternators of 1.2 KW, 2 KW, 3 KW and 7 KW capacities are also available.

Please contact our nearest Safety Company office for further information concerning this equipment.

THE SAFETY CAR HEATING AND LIGHTING COMPANY INC.

NEW YORK · CHICAGO · PHILADELPHIA · ST. LOUIS · SAN FRANCISCO · NEW HAVEN · MONTREAL

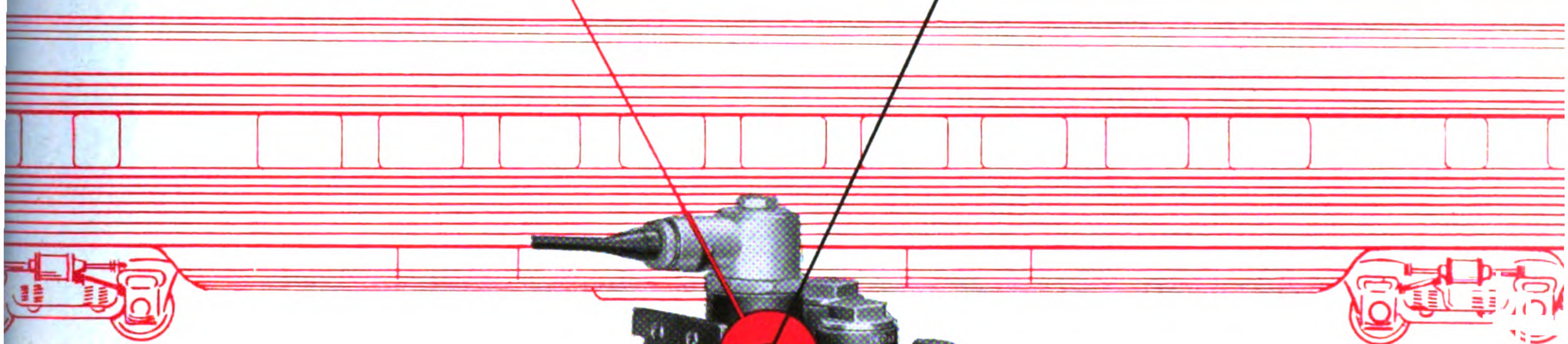
SAFETY COMPANY PRODUCTS INCLUDE: Air-conditioning Equipment • Genemotors • Generators • Fans • Regulators • Lighting Fixtures • Switchboards • Parcel Racks • Motor Alternators • Dynamotors • Motor Generators • Dual Voltage MG Sets

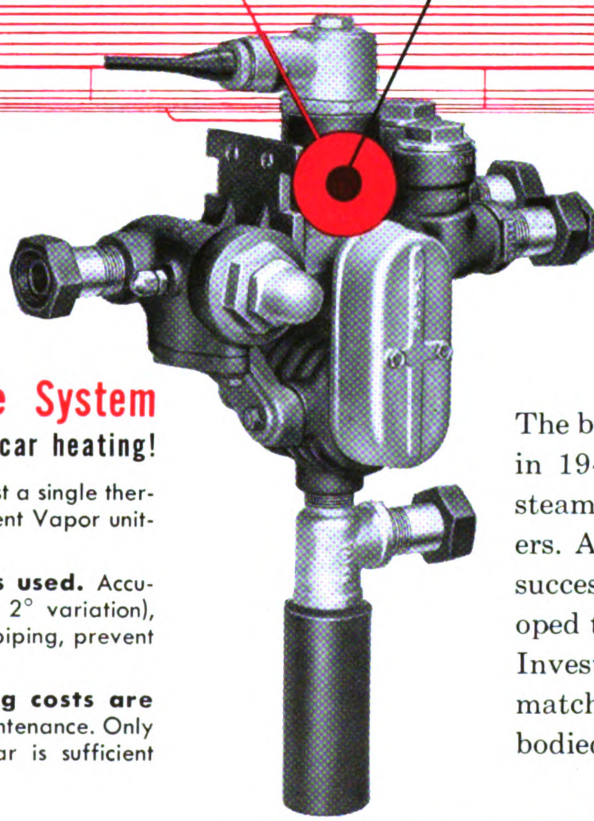


Part No. 1752-CC
(FULL SIZE)

THIS SINGLE UNIT
IS THE ONLY OPERATING PART
IN THE ENTIRE VAPOR
Unizone System
FOR HEATING
OPEN-BODIED CARS*

*Coaches, Parlor Cars, Diners, etc.





The VAPOR Unizone System has revolutionized open-bodied car heating!

FIRST, because it's so simple—just a single thermostat, a single regulator, and efficient Vapor unit-fin radiation.

SECOND, because less steam is used. Accurate car-temperature control (within 2° variation), and the virtual absence of exposed piping, prevent needless waste; conserve heat.

THIRD, because all car-heating costs are lower—first-cost, operating cost, maintenance. Only 10 to 15 minutes *per year* at the car is sufficient for annual servicing.

The basic idea of Unizone had its beginning in 1941 when Vapor pioneered a single steam control applied to 3200 troop sleepers. A thermostat was added in 1946, and successive improvements have fully developed today's outstanding Unizone System. Investigate, and you'll specify, this unmatched economical comfort for every open-bodied car—new, or going into your shops.

VAPOR HEATING CORPORATION

80 EAST JACKSON BLVD., CHICAGO 4, ILLINOIS

NEW YORK • ST. PAUL • DENVER • ST. LOUIS • PORTLAND • WASHINGTON • PHILADELPHIA
SAN FRANCISCO • JACKSONVILLE • RICHMOND • HOUSTON • MONTREAL • LOS ANGELES

Personnel Relations

"Public relations" and "employee relations" are two subjects which have been under discussion intermittently for many years. The tenor of the discussions has largely been such that the terms have come to stand for highly specialized subjects with which no one but experts are competent to deal. "Public-relations" or "employee-relations" programs implied projects formulated by specialists and consisting largely of advertisements and releases with which the general run of railway supervisors and officials had little responsibility.

It is encouraging to note evidences of a growing realization that public relations and employee relations are not unrelated subjects but are merely two aspects of a single subject—human relations.

This was stated clearly by L. C. Porter, vice-president of the Texas & Pacific, in his address before the September annual meeting of the Railway Fuel and Traveling Engineers' Association at Chicago. Mr. Porter, who was responsible for preparing the general outline of a public and employee relations program for his railroad, brought these subjects down from the rarefied realm of the specialist to the level of railroad men in the ranks, as well as supervisors and officers, by his definition of public relations—"The word 'public' means people," said he. "The word 'relations' has a number of meanings, but for the purpose of the definition, 'association, connection, or dealing with' is sufficient. Thus 'public relations' actually means association, connection, or dealings with people." Public relations and employee relations come down to a matter of the attitude of individuals in dealing with each other.

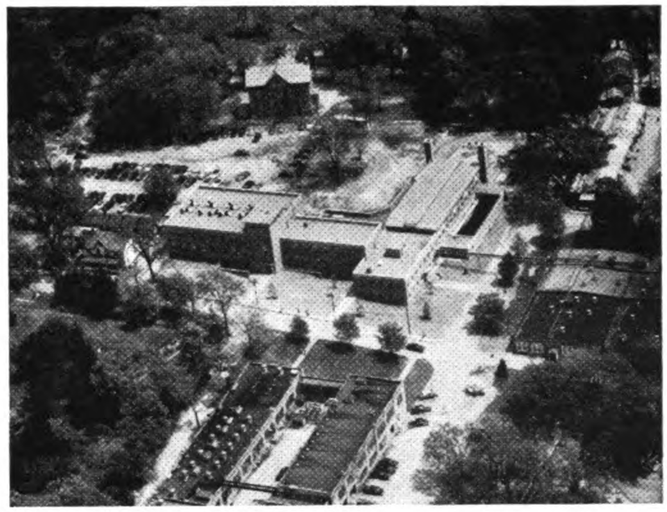
No program confined to propaganda of any kind ever gets to the heart of the matter. Good public relations can be obtained only when good employee relations prevail. Good employee relations are a matter of attitude in which representatives of the employer express—one might even say radiate—a spirit of good will toward employees. Until such an attitude is expressed by an employer and his representatives, it will not be reciprocated by the employees. The dealings of a railroad with the public are the dealings of individual employees with individual people. These relationships can be satisfactory only when the attitude of the employees is one of good will toward those with whom they deal. This attitude will not prevail unless a feeling of good will prevails in the relations between employer and employee.

The entire structure of satisfactory human relations, which incorporates satisfactory public relations and satisfactory employee relations, is founded on a simple basic principle. "It has been said that the first and best rule for good public and employee relations," said Mr. Porter, "is the Golden Rule."

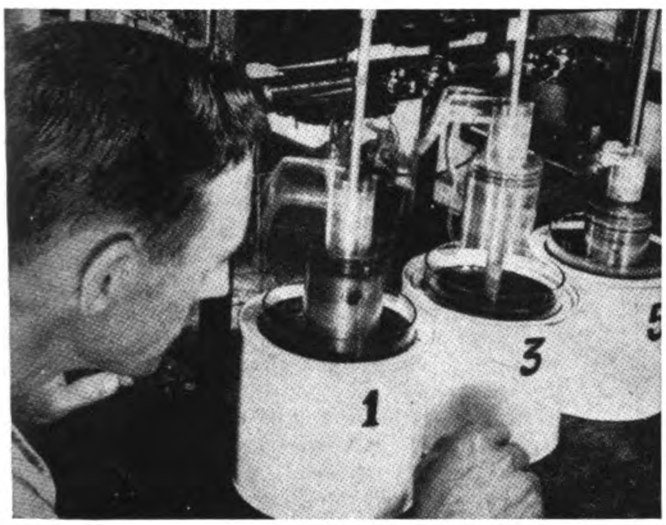
C. B. Peck

WHY TEXACO DIESEL LUBRICATING OILS

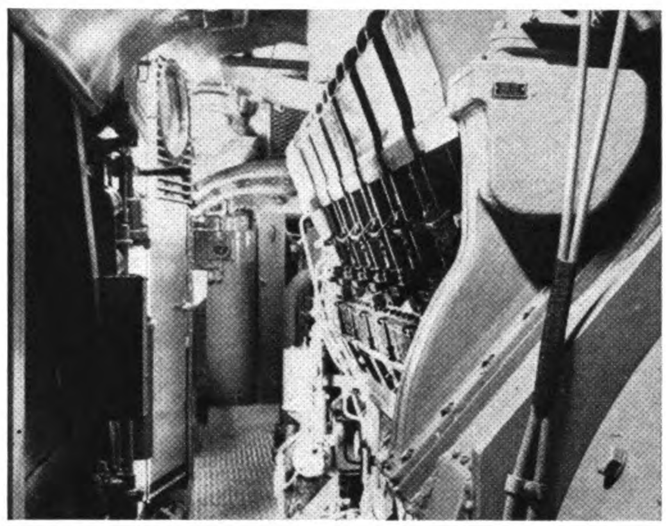
TEXACO LUBRICATION ENGINEERS — experienced railroad men — study lubrication problems at first hand.



RESEARCH SCIENTISTS in The Texas Company's Beacon Laboratories develop lubricants to meet specific needs.



BENCH TESTING speeds selection of best formulas which are then engine-tested by runs in full-scale laboratory and road Diesels.



FINAL TESTING is done in actual road service, under the exacting conditions of every type of operation.

RATE "FIRST WITH THE RAILROADS"

Skillful research, painstaking testing and extreme care in manufacture — these build the quality for which Texaco is famous. In conjunction with Texaco Systematic Engineering Service they have won for Texaco this first place with the railroads —

More railroad Diesel locomotives in the U.S. are lubricated with Texaco than with any other brand.

Enjoy the benefits of this unbeatable combination. Just call the nearest Railway Sales Office in New York, Chicago, San Francisco, St. Paul, St. Louis or Atlanta; or write:

☆ ☆ ☆

The Texas Company, *Railway Sales Department,* 135 East 42nd Street, New York 17, New York.

TEXACO Railroad Lubricants

AND SYSTEMATIC ENGINEERING SERVICE

Faithfully yours 50 for Fifty Years

TUNE IN: Tuesday nights on television—the TEXACO STAR THEATER starring MILTON BERLE. See newspaper for time and station.